Processor Circuitry. The module support circuitry consists of microprocessor U5, ROM U6, and RAM U12, all served by latch U2. Serial-to-parallel shift register U16 converts serial data to parallel data for the DACBUS. The system operates using an 11 MHz crystal-controlled oscillator. Sections U11 and U17 perform reset and buffer functions for the communications link.

SpO_2 Interface Board (No. 10734)

This board provides patient isolation circuitry between the power supply and patient connections. Communications signals (RXD, CTS, RESET, and TXD) between the module and the Peripheral Board are handled by optocouplers U4, U5, and U6. Dc-to-dc converter U3 provides a ±15 Vdc supply to the SpO_2 module. Dc-to-dc converter U2 provides a +5 Vdc supply to the SpO_2 module. Voltage regulator VR1 and associated components provide regulation for the +5 Vdc supply.

CAS NIBP Module Circuitry

The NIBP module is manufactured by CAS Medical Systems, Inc.

Processor Circuitry. Eight-bit processor U1 controls all communication with the Model 118 through its integral serial port; it also controls the pump and valves, calculates the measurement results, and performs the board's self-test. The microprocessor has an internal clock divider that divides down the 9.216 MHz crystal-controlled clock to 4.608 MHz. One section of U6 also divides down the clock to provide 2.304 MHz to analog-to-digital (A/D) converter U4. Memory consists of 64k x 8 EPROM U2 and 8k x 8 bit RAM U3. Decoding of the processor's address lines is performed by U8, U9, U10, and U11 which select the EPROM, RAM, A/D, pump and valve drivers, and provide amplification control.

A/D Conversion. A/D converter U4 performs a 10-bit conversion that digitizes the signals representing static pressure in the cuff and cuff pressure caused by arterial volume changes. A 2.5 V reference is supplied by U5; a 5 V supply is provided by linear regulator U13 which converts the module's 12 V input to 5 V. The output of U4 is sent to the microprocessor for calculations.

Watchdog Circuitry. Watchdog functions are provided by U7 which performs three functions: if the software fails to execute properly, the watchdog resets the processor, disables the pump, and opens the valves; or if the module's 5 V power supply falls below 4.5 V, the watchdog will also reset the module; or if overpressure switch S1 detects a cuff pressure above 300 mmHg (40 kPa), it works in conjunction with U7 to reset the module.

Instrumentation Amplifier. Compensated pressure transducer U16, produces an output voltage that is proportional to the cuff pressure; the output is input to the instrumentation amplifier section. Amplifiers U14 and U15 amplify the pressure transducer's output and separate it into two channels. One channel has relatively low gain and represents the static pressure in the cuff. The other channel has higher gain and represents the cuff pressure changes caused by arterial volume changes. The outputs of the instrumentation amplifier are sent to the processor . The processor can disable the high gain channel during cuff deflation to prevent signal distortion.

Valves. Valves V1 and V2 vent the cuff's pressure to atmosphere. Two valves are required to permit safe depressurization in the event of a defective valve; valve V1 has a restricted orifice. The processor selects the appropriate valve to quickly and accurately deflate the cuff based on the cuff's volume and pressure.

SETUP PROCEDURES

This section of the manual describes the routine setup procedures for the Model 118 as well as information about tailoring the unit to meet the individual needs of the hospital.

MOUNTING THE STRAIN GAUGE FOR IUP MONITORING

To mount the strain gauge on the Model 118:

1. Place the rod of the strain gauge mount through the holes on the strain gauge clip.
2. Attach the strain gauge mount to the side of the monitor by placing the lip of the top bracket into the groove between the chassis and top cover of the monitor. Place the bottom bracket in the groove in the bottom of the monitor.
3. Tighten thumb screw enough to seat mount firmly.
4. Gently snap the strain gauge into the plastic clip.

STRIP CHART RECORDER PAPER INSTALLATION

⚠ **CAUTION:** Use only recorder paper designed for use in the Model 116/118 Monitor. The Corometrics Catalog Number for this paper is 4305AAO (United States) or 4305BAO (International).

⚠ **CAUTION:** Using non-Corometrics paper in the Model 118 may produce inferior print quality. This may result in permanent damage to the recorder's print head and may void your warranty.

⚠ **CAUTION:** Do not use Corometrics Catalog Number 4303AAO/BAO paper in the Model 118— this paper is intended for use with *other* Corometrics monitors. Using this paper in the Model 118 may cause permanent damage to the recorder's print head and may void your warranty.

To install Corometrics Catalog Number 4305AAO/BAO chart paper, follow these steps:

1. Depress the lever on the right side of the strip chart recorder door. Pressing this lever causes the recorder door to open.
2. Hold the chart paper with the black squares facing up, and on the right hand side of the pack.
3. Fan pack of Z-fold paper on all sides to loosen folds and ensure proper feed of paper through recorder.
4. Unfold the paper from the **bottom** of the pack so that it extends towards you.
5. Place the pack in the drawer so that the black squares are up and the **paper extends out the bottom of the pack and over the roller.**

   NOTE: The black squares, referred to in step 5, indicate the end of the recorder paper. When the black squares appear, the strip chart recorder has approximately 20 minutes of paper remaining when running at 3 cm/min.
6. Close the strip chart recorder door.

CHART SPEED SWITCH

Set the **CHART SPEED** slide switch on the rear panel to the desired setting (1, 2, or 3 cm/min). The 3 cm/min setting is generally the accepted standard in the United States.

USER SETUP MENUS

Two setup menus provide the ability to tailor the Model 118 for varying clinical applications.* The setup screens are used as follows:

1. Depress the **Setup** pushbutton once to display the first setup screen.
2. Depress the **Select** pushbutton to move the cursor ▶ key between fields (menu items). Successively depress this pushbutton until the cursor points to the field you wish to change. The menu item will flash in the active field.

---

* *The monitor's Setup Mode configuration can be printed via the internal service tests. Refer to Section 8, Diagnostic Self-Tests for more information.*

3. With the cursor pointed to the desired field, use the △ ▽ pushbuttons to cycle through the available choices for a menu field. Successive depression of the △ button causes the selected field to increment through the available choices; successive depression of the ▽ button causes the selected field to cycle through the available choices in the reverse order. The sequential order, always begins at the current setting; successive depressions of a key continue to increment or decrement the choices and will continue to wrap around. For example, an incrementing order might be 5, 10, 15, 30, 60, 120, 1, 2, 3, 4, 5..., etc.

4. Repeat steps two (2) and three (3) until all desired settings have been made.

5. Depress the **Setup** pushbutton a second time to display the second setup screen.

6. Repeat steps two (2) and three (3) until all desired settings have been made.

7. Depress the **Setup** pushbutton a third time to return the unit to normal operation.

⚠ **IMPORTANT!** All changes, with the exception of volume settings, take effect ***after*** exiting the setup menus. If a setup screen remains idle for 15 minutes, the unit automatically exits setup mode and returns to normal operation. All changes that were made in Setup Mode prior to the 15-minute period of inactivity are automatically saved.

NOTE: While in Setup Mode, the unit is monitoring both fetal and maternal parameters and under an alarm condition, an audio alarm will be issued (if enabled) — the setup mode does not provide a visual alarm condition. Depression of the **Alarm Cancel** pushbutton will remove the audio alarm.

NOTE: Upon exiting Setup Mode, the visual alarm indication is shown, regardless of whether or not the audio alarm is enabled and regardless of whether or not the **Alarm Cancel** pushbutton was depressed.

Setup Menu #1

The first setup menu (refer to Figure 5-1) allows you to:

- select a time interval for automatic blood pressure determinations;
- set the SpO_2 pulse volume;
- choose the averaging mode for SpO_2 response time;
- choose the time interval for printing SpO_2 values;
- enable/disable SpO_2 trend trace printing;
- set the time and date.

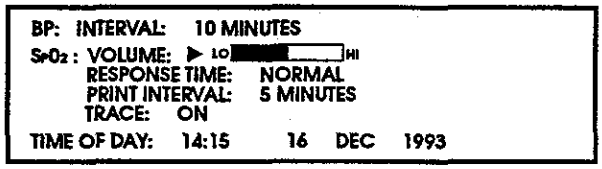
BP: INTERVAL: 10 MINUTES
SpO2: VOLUME: ▶ LO HI
RESPONSE TIME: NORMAL
PRINT INTERVAL: 5 MINUTES
TRACE: ON
TIME OF DAY: 14:15 16 DEC 1993

Figure 5-1. Setup Menu #1

NOTE: If your monitor is not equipped with blood pressure monitoring capabilities, the setup screen will not show the blood pressure interval option. If your monitor is not equipped with SpO_2 monitoring capabilities, the setup screen will not show the following options: SpO_2 pulse volume, SpO_2 averaging mode, and SpO_2 trend trace print.

BP Interval. This setting determines the wait period, in minutes, between automatic blood pressure determinations. The interval time is measured from beginning to beginning of determinations. Pressing the △ or ▽ pushbutton increments or decrements the selection choices. The available intervals are 1*, 2, 3, 4, 5, 10, 15, 30, 60, and 120 minutes. (The factory default setting is 15 minutes.)

SpO_2 Volume. This field is a bar graph used to set the volume of the pulse tone. When SpO_2 monitoring is in progress, the pulse beat is indicated with a "beep" that varies in pitch to reflect changes in the oxygen % saturation reading. The pitch rises as the % saturation values increase; the pitch lowers as % saturation values decrease. Pressing the △ pushbutton increases the SpO_2 volume. Pressing the ▽ pushbutton decreases the SpO_2 volume. As you adjust the volume, a sample

* *The Model 118 is factory-set with the optional 1-minute interval time disabled. For information on enabling the 1-minute interval, refer to One Minute Blood Pressure Interval in this section.*

SpO_2 beep sounds. Full range audio volume is represented by a solid bar graph. Disabled audio is represented by an empty bar graph. (The unit is configured at the factory with the SpO_2 volume set at 50% and represented by a bar graph that is filled halfway.)

SpO_2 Response Time. The Model 118's pulse oximetry module contains three response time modes in order to compensate for different levels of patient activity. Pressing the △ or ▽ pushbutton increments or decrements the selection choices. The available modes are SLOW, NORMAL, and FAST. Decrementing follows the reverse sequence. The SLOW mode of operation uses a 10- to 15-second averaging period and is least affected by patient movement. The NORMAL mode of operation uses a 5- to 7-second averaging period and is recommended in cases where the patient is relatively inactive. The FAST mode of operation uses a 2- to 3-second averaging time and is most affected by patient movement. (The factory default setting is NORMAL.)

> **NOTE:** When the SpO_2 Response Time is set to SLOW, no pulse is shown in the maternal display (if SpO_2 is the pulse source). Instead, steady dashes (– – –) appear in the pulse display area.

SpO_2 Print Interval. This option applies to the internal SpO_2 module or an external device connected to the Model 118. This setting determines the time interval for printing the SpO_2 values on the strip chart paper. Pressing the △ or ▽ pushbutton cycles through the available settings. The available intervals are OFF, and 2, 5, 10, 15, 30, and 60 minutes. (The factory default setting is 5 minutes.)

SpO_2 Trace. This option applies only to the internal SpO_2 module. This setting enables or disables the plotting of the SpO_2 trend on the uterine activity channel. Pressing the △ or ▽ pushbutton alternates between ON and OFF. When enabled (ON), the uterine activity trend is printed in normal print density while the SpO_2 trend is printed in a heavier density. The SpO_2 trend is plotted over a range of 60–100 % on Domestic Paper (HR Scale: 30–240 BPM) or 50–100 % on International Paper (HR Scale: 50–210 BPM).

Time of Day. It is very important to set the Model 118's clock prior to initial operation and during daylight-saving time changes. A long-lasting battery maintains the set time even when the monitor is unplugged. If a clock circuit fault is detected when the recorder is turned ***on***, the message "SET TIME/ DATE" will be printed on the recorder paper every 10 minutes. After the clock is set, the message terminates and the real time is printed. The unit is factory preset for Eastern Standard Time.

The time is represented by a 24-hour clock in hours and minutes. The hour field has a range from 00-23. The minutes field has a range from 00-59. The month choices are JAN, FEB, MAR, APR, MAY, JUNE, JULY, AUG, SEPT, OCT, NOV, DEC. The range for the day is 01-31. The range for the year is 1993–2092.

Pressing the △ pushbutton cycles through available choices; pressing the ▽ pushbutton cycles through the choices in the reverse direction.

Setup Menu #2

The second setup screen (refer to Figure 5-2) allows you to:

- enable/disable the BP, SpO_2, and MECG audio alarms;
- define the high and low alarm limits for systolic, diastolic, and mean arterial pressures, pulse rate, and oxygen saturation;
- set the audio alarm volume;
- set the re-alarm time for SpO_2 and MECG.

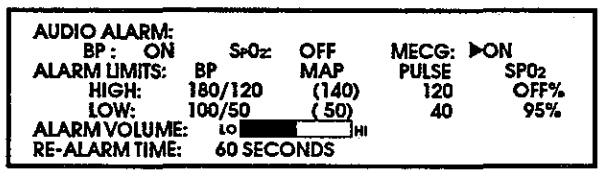

Figure 5-2. Setup Menu #2

> **NOTE:** If your monitor is not equipped with blood pressure monitoring capabilities, the setup screen will not show an option for the BP audio alarm or alarm limit options for systolic, diastolic, or mean arterial pressures. If your monitor is not equipped with SpO_2 monitoring capabilities, the setup screen will not show an option for the SpO_2 audio alarm.

Audio Alarms. Three distinct fields enable/disable the audio alarm function for BP, SpO_2, and MECG. Pressing the △ or ▽ pushbutton alternates between ON and OFF. When an audio alarm is off, only a visual indication will be given for a patient alarm condition or system alarm. When an audio alarm is on, an audible alarm is issued upon a patient alarm or a system alarm condition. The audible alarm is represented by the following sequence: alternating high/low tones for four seconds and silence for 7 seconds. The sequence continues until the alarm condition is removed. When a parameter's audio alarm is enabled ***and*** none of the high or low limits are turned off, Alarm Enable Indicator is displayed on the vital signs display. When a parameter's audio alarm is disabled ***or*** any of the high or low alarm limits are turned off, the Alarm Disable Indicator is displayed. (The factory default settings are enabled (on) for all audio alarms.)

> **NOTE:** While turning an Audio Alarm off will always result in the Alarm Disable Indicator, the appearance of the Alarm Disable Indicator does not necessarily mean that the Audio Alarm is off. For example, if the BP Audio Alarm is on but the high limit for systolic pressure is off, the Alarm Disable Indicator is displayed.

⚠ **IMPORTANT!** The MECG audio alarm is for the maternal pulse when MECG is active. The SpO_2 audio alarm is for the % oxygen saturation and the maternal pulse (if SpO_2 is the maternal pulse source — MECG inactive). The BP audio alarm is for the systolic pressure, diastolic pressure, mean arterial pressure, and the maternal pulse (if BP is the pulse source — MECG and SpO_2 inactive).

Alarm Limits. These fields are used to adjust the high and low alarm limits for systolic, diastolic, and mean arterial pressures, pulse rate, and % oxygen saturation. When a parameter value falls outside the set range, a visual and audible (if enabled) alarm will be issued. The selectable values are listed in Table 5-1. The factory default values are listed in Table 5-2. Use the △ or ▽ pushbutton to cycle through all the available selection choices. Blood pressure limits change in units of 5 mmHg (0.5 kPa); maternal pulse limits change in units of 5 bpm; and % oxygen saturation limits change in units of 1%.

When a parameter's audio alarm is enabled ***and*** none of the high or low limits are turned off, the speaker symbol is displayed on the vital signs display. When a parameter's audio alarm is disabled ***or*** any of the high or low alarm limits are turned off, the speaker symbol with a slash is displayed.

⚠ **IMPORTANT!** The maternal pulse can be determined by MECG, SpO_2, and BP; however, only one value is *displayed* on the EL panel. If more than one method is employed, the order of display priority is MECG, SpO_2, then BP. ***Likewise, only the high-priority displayed value is used when evaluating a maternal pulse alarm condition.*** For example: If MECG and SpO_2 are both employed, an alarm for pulse is only issued if the MECG value violates the pulse alarm condition.

Alarm Volume. This field is a bar graph used to set the volume of all audio alarms. When an audio alarm is enabled, an audible alarm is issued upon a patient alarm or a system alarm condition. The audible alarm is described as the following sequence: alternating high/low tones for four seconds and silence for 7 seconds; the sequence continues until the alarm condition is removed. Pressing the △ pushbutton increases the alarm volume. Pressing the ▽ pushbutton decreases the alarm volume. As you adjust the alarm volume, a sample alarm will sound with continuous alternating high/low tones. Maximum audio volume is represented by a solid bar graph. There is a minimum volume setting. (The unit is configured at the factory with the alarm volume set at 58% as represented by a bar graph that is filled slightly more than halfway.)

Re-Alarm Time. When an alarm is cancelled using the **Alarm Cancel** pushbutton, the visual and audible indicators are removed. However, for MECG and SpO_2 (oxygen saturation or maternal pulse) monitoring, an alarm will be re-issued if the alarm state continues. This field is used to adjust the temporary silence period. Pressing the △ or ▽ pushbutton increments or decrements the selection choices. The temporary silence period is adjustable in units of 5 from 30 to 120 seconds; it can also be set to OFF. (The unit is configured at the factory with a default value of 60 seconds.)

Table 5-1. Alarm Limit Ranges

SELECTABLE RANGES	BLOOD PRESSURE (mmHg) [kPa]			PULSE (BPM)	OXYGEN SATURATION (%)
	Systolic	Diastolic	Mean Arterial		
High Limit	70–240, OFF [9.5–32.0, OFF]	70–130, OFF [9.5–17.5, OFF]	70–150, OFF [9.5–20.0, OFF]	100–250, OFF	85–100
Low Limit	OFF, 50-150 [OFF, 6.5–20.0]	OFF, 30-120 [OFF, 4.0–16.0]	OFF, 30-120 [OFF, 4.0–16.0]	OFF, 30–120	OFF, 80–99

Table 5-2. Factory Default Alarm Limits

DEFAULT LIMITS	BLOOD PRESSURE (mmHg) [kPa]			PULSE (BPM)	OXYGEN SATURATION (%)
	Systolic	Diastolic	Mean Arterial		
High Limit	180 [24.0]	120 [16.0]	140 [18.5]	120	100
Low Limit	100 [13.0]	50 [6.5]	50 [6.5]	40	95

Table 5-3. Factory Default Settings

OPTION	DEFAULT SETTING
BP Time Interval	15 minutes
SpO_2 Pulse Volume	50 % of maximum
SpO_2 Response Time Averaging Mode	Normal
SpO_2 Trace Print	OFF
Time of Day	Eastern Standard Time
SpO_2 Print Interval Time	5 minutes
All Audio Alarms (BP, SpO_2, MECG)	ON
Alarm Volume	58 % of maximum
Re-Alarm Time	60 seconds

SERVICE SETUP OPTIONS

The Model 118 is equipped with many service personnel diagnostic tests and setup options that allow you to configure the unit to the needs of your hospital. Items that are frequently changed are accessible through software menus in the Service Mode of the unit. Items that are usually set only once, or infrequently, are accessible through hardware switches on the Model 118 Peripheral Board (No. 10621).

Service Mode Screens

The Model 118 is programmed with five main Service Mode screens that are enabled or disabled through hardware switches on the Peripheral Board (No. 10621). These screens are summarized below:

Service Screen #1. This screen, shown in Figure 5-3, allows you to:

- enable/disable the heart rate offset function;
- adjust the volume of the startup tones;
- adjust the volume of the "beeps" emitted at the end of a blood pressure determination;
- identify the CPU Board software version number.

More detailed information on configuring these three items is provided later in this section.

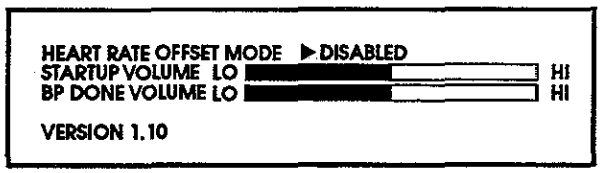

Figure 5-3. Service Screen #1

Service Screen #2. This screen, shown in Figure 5-4, allows you to configure the unit's J109 and J110 RS-232C Serial Interface connectors. These ports allow connecting to optional peripheral equipment. Each port is configured for the following:

- baud rate
- parity
- mode

Refer to *Section 13, External Device Interfacing* in this manual for detailed information about using Service Screen #2.

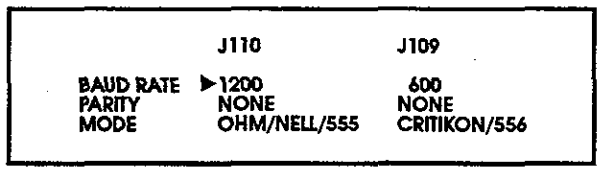

Figure 5-4. Service Screen #2

Service Screen #3. This screen, shown in Figure 5-5, permits access to the 18 internal service diagnostic tests. This information is covered in *Section 8, Diagnostic Self-Tests* in this manual.

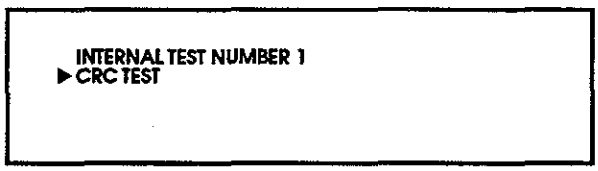

Figure 5-5. Service Screen #3

Service Screen #4. This screen, shown in Figure 5-6, provides a functionality test for all front panel pushbuttons. This information is discussed in *Section 8, Diagnostic Self-Tests* in this manual.

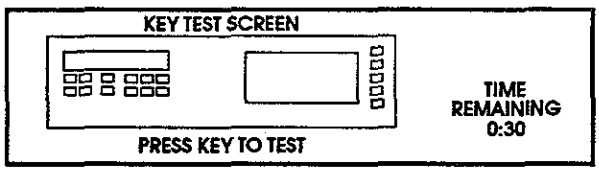

Figure 5-6. Service Screen #4

Service Screen #5. This screen, shown in Figure 5-7, controls some of the optional configuration settings. Use this screen to:

- configure the power-on settings for the user Setup Mode: Setup Menu #1 and Setup Menu #2;
- enable/disable the one-minute blood pressure interval time;
- enable/disable the SpO_2 disconnect alarm.

The Model 118 Service Mode can be configured via hardware switches on the Peripheral Board (No. 10621) to include or exclude Service Screen #5. When this screen is disabled, the unit reverts to the factory-set defaults. The factory defaults for Setup Menu #1 and

Setup Menu #2 are listed in Table 5-3. The one-minute blood pressure interval time default is disabled (OFF), and the SpO_2 disconnect alarm default is enabled (ON).

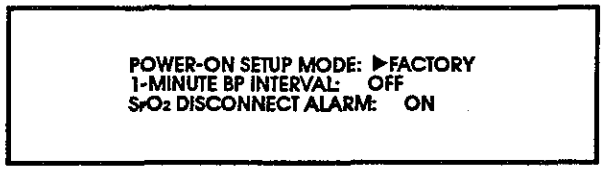

Figure 5-7. Service Screen #5

Hardware Switches

The Model 118 Peripheral Board (No. 10621) contains two dip switch packs, SW1 and SW2, which are used to:

- enable/disable Service Mode screens;
- enable/disable Service Screen #5;
- select a language for printing on the strip chart recorder paper;
- set the strip chart recorder paper scale corresponding to the type of paper that is used;
- select a measurement unit for IUP and BP monitoring;
- signals presence of internal blood pressure module.

More detailed information on using these switches is provided later in this section.

ENABLING/DISABLING SERVICE MODE SCREENS

All five Service Mode screens can be locked via a hardware switch on the Peripheral Board (No. 10621) to prevent access from unauthorized personnel. When the switch is set to the lock position, the screens cannot be accessed via the front panel **Test** pushbutton. To change this setting:

1. Turn off the Model 118.
2. Remove the Model 118 top cover and locate the Peripheral Board (No. 10621). When facing the unit from the front, the Peripheral Board is the third board from the left in the unit's card cage. On the Peripheral Board, locate SW1. SW1 is on the bottom left edge of the board.
3. Set switch SW1-2 according to Table 5-4.
4. Re-install the Model 118 top cover.
5. Power on the monitor while depressing and holding the **Test** pushbutton. Service Screen #1 is automatically displayed. Refer to *Section 8, Diagnostic Self-Tests* for more information about using the Service Mode screens.

Table 5-4. Service Mode Screens — Peripheral Board Switch Settings

SERVICE MODE SCREENS	SW1-2
Unlocked	Off
Locked	On

HEART RATE OFFSET MODE

When using dual ultrasound or ultrasound and direct FECG, overlapping FHR trends may be difficult to interpret. The Model 118 provides a +20BPM shift for the US or US2 trend to alleviate this problem.

⚠ **IMPORTANT:** The heart rate offset mode is recommended for **intermittent** use. Use the offset mode only when dual heart rate tracings overlap and become difficult to interpret. When using the heart rate offset mode, always document the **actual** FHR.

When the heart rate trend is shifted, a Mark (↑) symbol and a dotted line will be printed on the lower section of the heart rate scale indicating the starting position of the offset mode. Also, one of the following symbols will be printed on the upper portion of the heart rate scale: US + 20 (for US/FECG or US2/FECG) or US2+20 (for US/US2).

To shift the ultrasound trend, first the mode must be ***enabled.*** The heart rate offset mode is disabled (*off*) when shipped from the Corometrics Factory. There are three settings in this mode: two are enables and one is a disable as follows:

Disabled. The heart rate offset mode is disabled.

Enabled. The heart rate offset mode is enabled.

10 Min. The heart rate offset mode is enabled with an auto-revert feature. If a trace is shifted, the heart rate will revert back to the normal (unshifted) level after the 10-minute timer expires.

Refer to the Model 118 Operator's Manual for more information about using the heart rate offset mode. To enable/disable the heart rate offset mode:

1. Enter the Service Mode by powering on the Model 118 while depressing and holding the **Test** pushbutton. Service Screen #1 is automatically displayed.

2. Use the **Select** pushbutton to position the cursor on the Heart Rate Offset Mode field.

2. Use the △ ▽ pushbuttons to cycle through the choices: DISABLE, ENABLE, 10 MIN.

3. Press **Setup** to display another Service Mode screen; *or* press **Record** or **Test** to exit the Service Mode.

ADJUSTING THE STARTUP VOLUME

When the Model 118 is powered on, three startup tones are emitted from the rear panel speaker. The default volume for these tones is set at 58% of the maximum volume. To adjust the startup volume:

1. Enter the Service Mode by powering on the Model 118 while depressing and holding the **Test** pushbutton. Service Screen #1 is automatically displayed.

2. Use the **Select** pushbutton to move the cursor ▶ to the Startup Volume bar graph.

3. Use the △ ▽ pushbuttons to increase/decrease the volume of the startup tones. Sample tones are given with each adjustment.

4. Use the **Select** key to move the cursor ▶ to another option on this screen; *or* use the **Setup** pushbutton to display a different Service Mode screen; *or* press **Record** or **Test** to exit the Service Mode.

ADJUSTING THE BP DONE VOLUME

When a successful blood pressure determination is made, the monitor emits three short "beeps" from the rear panel speaker. The default volume for these "beeps" is set at 58% of the maximum volume. To adjust this volume:

1. Enter the Service Mode by powering on the Model 118 while depressing and holding the **Test** pushbutton. Service Screen #1 is automatically displayed.

2. Use the **Select** pushbutton to move the cursor to the BP Done Volume bar graph.

3. Use the △ ▽ pushbuttons to increase/decrease the volume of the "beeps." Sample beeps are given with each adjustment.

4. Use the **Select** key to move the cursor ▶ to another option on this screen; *or* use the **Setup** pushbutton to display a different Service Mode screen; *or* press **Record** or **Test** to exit the Service Mode.

ENABLING SERVICE SCREEN #5

The Service Mode of the Model 118 can be configured to include or exclude Service Screen #5. When this screen in disabled, the factory default settings of the monitor remain set. When this screen is enabled, you can:

- configure the power-on settings for the user Setup Mode: Setup Menu #1 and Setup Menu #2;
- enable/disable the one-minute blood pressure interval time;
- enable/disable the SpO_2 disconnect alarm.

To enable Service Screen #5:

1. Turn off the Model 118.

2. Remove the Model 118 top cover and locate the Peripheral Board (No. 10621). When facing the unit from the front, the Peripheral Board is the third board from the left in the unit's card cage. On the Peripheral Board, locate SW2. SW2 is on the bottom left edge of the board, to the right of SW1.

3. Set switches SW2-5, SW2-6, SW2-7, and SW2-8 according to Table 5-5.

4. Re-install the Model 118 top cover.

5. Enter the Service Mode by powering on the monitor while depressing and holding the **Test** pushbutton. Service Screen #1 is displayed.

6. Press the **Setup** pushbutton four times to display Service Screen #5, shown earlier in Figure 5-7.

7. Perform one of the procedures described in the following text: *Power-On Setup Mode, One-Minute Blood Pressure Interval,* or *SpO_2 Disconnect Alarm.*

8. Use the **Select** key to move the cursor ▶ to another option on this screen; or use the **Setup** pushbutton to display a different Service Mode screen; *or* press **Record** or **Test** to exit the Service Mode and save the new setting.

Table 5-5. Service Screen #5 — Peripheral Board Switch Settings

SERVICE SCREEN #5	SW2-5	SW2-6	SW2-7	SW2-8
ENABLED (Defaults selected via Service Mode)	Off	On	Off	On
DISABLED (Factory defaults only)	Any other setting			

POWER-ON SETUP MODE

There are three ways to define the power-on settings on Setup Menu #1 and Setup Menu #2 via Service Screens. The three options are:

- Factory
- Current
- Hospital-Wide

Factory

If the Power-On Setup Mode is set to FACTORY, the monitor will power up with the settings that are listed in Table 5-2 and Table 5-3. To set this option to FACTORY:

1. While Service Screen #5 is displayed, use the **Select** pushbutton to move the cursor ▶ to the Power-On Setup Mode field.
2. Use the △ ▽ pushbuttons to display FACTORY.
3. Press **Record** or **Test** to exit the Service Mode and save the new Power-On Setup Mode setting.
4. Cycle power on the Model 118. The monitor will power up each time with the settings that are listed in Table 5-2 and Table 5-3.

   NOTE: Whenever the FACTORY option is chosen, any previously saved HOSPITAL-WIDE settings are erased.

Current

If the Power-On Setup Mode is set to CURRENT, the monitor will power up with the last-used Setup Mode menu settings (stored in battery-backed memory). To set this option to CURRENT:

1. While Service Screen #5 is displayed, use the **Select** pushbutton to move the cursor ▶ to the Power-On Setup Mode field.
2. Use the △ ▽ pushbuttons to display CURRENT.
3. Press **Record** or **Test** to exit the Service Mode and save the new setting. The monitor will power up each time with the last-used Setup Mode settings.

Hospital-Wide

Corometrics defined the factory default settings in an effort to meet the requirements of a typical labor and delivery environment. However, Corometrics recognizes that clinical applications may vary. Therefore, the Hospital-Wide mode allows you to configure your own Setup Mode menus to meet the individual needs of your hospital.

When the Power-On Setup Mode is set to HOSPITAL-WIDE, the monitor will power up each time with your custom menus. The functionality of the HOSPITAL-WIDE setting differs according to whether you are *defining* the Hospital-Wide Setup Mode menus or whether you are *returning* to HOSPITAL-WIDE from CURRENT.

NOTE: Hospital-Wide Setup Mode menus are erased from the monitor's memory whenever the FACTORY option is selected. However, you can alternate back and forth between CURRENT and HOSPITAL-WIDE and the Hospital-Wide settings are retained in memory. It is recommended that you keep a written record of your custom-designed Setup Mode menus in your files in case they are inadvertently erased during servicing of the monitor. Refer to *Section 8, Diagnostic Self-Tests* and read about Test #14, Print User Setup. This test provides a listing of the monitor's Setup Mode configuration.

Defining Hospital-Wide Setup Mode Menus. To define Hospital-Wide Setup Mode menus for the first time, or after they have been erased by the factory defaults; or to re-define existing hospital-wide Setup Mode menus:

1. While Service Screen #5 is displayed, use the **Select** pushbutton to move the cursor ▶ to the Power-On Setup Mode field.
2. Use the △ ▽ pushbuttons to display NEW HOSPITAL.
3. Press **Record** or **Test** to exit the Service Mode and save the new Power-On Setup Mode setting.
4. Use the Setup Mode to define the hospital-wide menus. (Refer to *Setup Menus* on page 5-1.) You must exit the Setup Mode properly, using the **Setup** pushbutton, and return the unit to normal operation in order to save the new settings.

5. Cycle power on the Model 118. The monitor will power up each time with this set of pre-defined hospital Setup Mode menus.

Returning to Hospital-Wide Setup Mode Menus. To return to HOSPITAL-WIDE from CURRENT:

1. While Service Screen #5 is displayed, use the **Select** pushbutton to move the cursor ▶ to the Power-On Setup Mode field.

2. Use the △ ▽ pushbuttons to display HOSPITAL-WIDE.

3. Press **Record** or **Test** to exit the Service Mode and save the new Power-On Setup Mode setting.

4. Cycle power on the Model 118. The monitor will power up each time with the previously defined Hospital-Wide Setup Mode menus.

ONE-MINUTE BLOOD PRESSURE INTERVAL

The Model 118 is factory-set to disable the one minute blood pressure interval on the user Setup Menu #1. To enable/disable the one-minute blood pressure interval time:

1. While Service Screen #5 is displayed, use the **Select** pushbutton to move the cursor ▶ to the 1-Minute BP Interval field.

2. Use the △ ▽ pushbuttons to alternate between the settings of ON and OFF.

3. Press **Record** or **Test** to exit the Service Mode and save the new setting.

4. Cycle power on the Model 118. The monitor will power up each time with the option selected in step 2.

SpO_2 DISCONNECT ALARM

The Model 118 is factory set with the SpO_2 disconnect alarm enabled. When enabled, a visual and audible alarm is issued whenever the SpO_2 intermediate cable becomes disconnected from the monitor front panel or from the SpO_2 sensor assembly cable. The visual indicator is given by flashing dashes (– – –) in the oxygen saturation and pulse (if SpO_2 is the pulse source) display areas. The audible alarm is described as an alternating high-low tone for four seconds followed by silence for seven seconds. The sequence continues until the alarm condition is removed — either by reconnecting the cable or by depressing the **Alarm Cancel** pushbutton. (If the **Alarm Cancel** pushbutton is depressed, the oxygen saturation and pulse (if SpO_2 is the pulse source) are removed from the display.) When disabled, a disconnect condition will remove the oxygen saturation and pulse values (if SpO_2 is the pulse source) from the display. To enable/disable the SpO_2 disconnect alarm:

1. While Service Screen #5 is displayed, use the **Select** pushbutton to move the cursor ▶ to the SpO_2 Disconnect Alarm field.

2. Use the △ ▽ pushbuttons to alternate between the settings of ON and OFF.

3. Press **Record** or **Test** to exit the Service Mode and save the new setting.

4. Cycle power on the Model 118. The monitor will power up each time with the option selected in step 2.

LANGUAGE SELECTION

Changing the language printed on the Model 118's strip chart recorder paper requires setting hardware switches on the Peripheral Board. The language options are English, Spanish, French, German, Japanese, and Italian. To change this setting:

1. Turn off the Model 118.
2. Remove the Model 118 top cover and locate the Peripheral Board (No. 10621). When facing the unit from the front, the Peripheral Board is the third board from the left in the unit's card cage. On the Peripheral Board, locate SW1. SW1 is on the bottom left edge of the board.
3. Set switches SW1-4, SW1-5, and SW1-6 according to Table 5-6.
4. Re-install the Model 118 top cover.
5. Power on the monitor.

STRIP CHART RECORDER SCALE

Changing the paper scale setting on the Model 118's strip chart recorder requires setting a hardware switch on the Peripheral Board. The Domestic paper scale is 30–240 BPM/cm; the International paper scale is 50–210 BPM/cm. The SpO_2 trend trace scale is also affected by this setting. The scale is 60–100 % (10 %/cm) for Domestic paper or 50–100 % (12.5 %/cm) for International paper. To change this setting:

1. Turn off the Model 118.
2. Remove the Model 118 top cover and locate the Peripheral Board (No. 10621). When facing the unit from the front, the Peripheral Board is the third board from the left in the unit's card cage. On the Peripheral Board, locate SW1. SW1 is on the bottom left edge of the board.
3. Set switch SW1-3 according to Table 5-7.
4. Re-install the Model 118 top cover.
5. Power on the monitor.

Table 5-6. Language — Peripheral Board Switch Settings

LANGUAGE	SW1-4	SW1-5	SW1-6
English	Off	Off	Off
Spanish	Off	Off	On
French	Off	On	Off
German	Off	On	On
Japanese	On	Off	Off
Italian	On	Off	On

Table 5-7. Strip Chart Recorder Scale — Peripheral Board Switch Settings

PAPER SCALE	SW1-3
Domestic (30–240 BPM/cm; 60–100 %)	Off
International (50–210 BPM/cm; 50–100 %)	On

IUP AND BP UNITS SELECTION

Changing the IUP and BP units measurement on the Model 118 displays requires setting hardware switches on the Peripheral. Select either mmHg or kPa, independently for each parameter. To change these settings:

1. Turn off the Model 118.
2. Remove the Model 118 top cover and locate the Peripheral Board (No. 10621). When facing the unit from the front, the Peripheral Board is the third board from the left in the unit's card cage. On the Peripheral Board, locate SW2. SW2 is on the bottom left edge of the board, to the right of SW1.
3. Set switches SW2-1 (for blood pressure units) and SW2-2 (for uterine activity units) according to Table 5-8.
4. Re-install the Model 118 top cover.
5. Power on the monitor.

BP MODULE SETTING

If a blood pressure module is installed in the Model 118, this information must be communicated to the Peripheral Board via a hardware switch. This helps the Model 118 software distinguish between cases where a blood pressure module is not installed and cases where there is a problem with an installed module. To configure this switch:

1. Turn off the Model 118.
2. Remove the Model 118 top cover and locate the Peripheral Board (No. 10621). When facing the unit from the front, the Peripheral Board is the third board from the left in the unit's card cage. On the Peripheral Board, locate SW2. SW2 is on the bottom left edge of the board, to the right of SW1.
3. Set switch SW2-3 according to Table 5-9.
4. Re-install the Model 118 top cover.
5. Power on the monitor.

Table 5-8. Pressure Units — Peripheral Board Switch Settings

PRESSURE UNITS	BLOOD PRESSURE SW2-1	UTERINE ACTIVITY SW2-2
mmHg*	Off	Off
kPa	On	On

*factory default setting

Table 5-9. BP Module Status — Peripheral Board Switch Settings

BP MODULE STATUS	SW2-3
Not Installed	Off
Installed	On

FUNCTIONAL CHECKOUT PROCEDURE

Like all electronic monitoring devices, internal and external components are subject to fatigue, wear, and the potential for failure over time and under varying conditions of use. Additionally, events such as dropping the monitor, spilling liquids on the monitor, or crimping the lead wires or patient cables can cause damage which may affect the overall system performance. Therefore, between Factory Service visits it is necessary that the proper operation of each monitor be verified by performing the Functional Checkout Procedure described in this section. This procedure should be completed prior to initially placing the monitor on a patient, when monitor performance needs to be verified, on a semi-annual basis, or more frequently as dictated by your equipment maintenance and management policies.

> **NOTE:** Read each step of this procedure thoroughly before actually performing the test.

EQUIPMENT REQUIRED

The following items are necessary for performing any of the tests in this procedure:

- Corometrics Model 305 Fetal Monitor Input Simulator and corresponding line cord and Model 118 Interconnect cables
- Model 116/118 Legplate
- Ultrasound Transducers (2)
- Tocotransducer
- Strain Gauge Transducer

GENERAL

Visually inspect the monitor, patient cables, and other accessories for cracks, fissures, or other signs of wear or damage. Do not use any monitor or accessory which appears to be worn or damaged. If unsure, contact your Corometrics Service Representative to arrange for evaluation, replacement, or repair of the suspect item(s).

SELF-TEST

The Model 118 contains test routines which verify the unit's calibration and internal circuitry. These routines are initiated by depressing the front panel **Test** pushbutton. The test results are printed on the strip chart recorder paper, verifying the integrity of the unit.

It is recommended practice to initiate the self-test feature at the beginning of each monitoring session.

1. Check the voltage rating on the rear panel fuseholder of the Model 118 and ensure it matches the line voltage of the receptacle to be used. Connect the detachable line cord to the rear panel **J101** connector; plug the other end into a hospital grade grounded wall outlet of appropriate voltage.

2. Depress the **Power** pushbutton on the front panel of the monitor. When the power is first turned on, verify that three tones are emitted from the rear panel speaker and the green power on indicator is lit.

3. Depress the Model 118 **Test** pushbutton and verify the following:

   - All EL display pixels illuminate for one second and then extinguish for one second. Afterwards, a vertical line moves across the screen from left to right, followed by a horizontal line moving from top to bottom. The display then remains black.

   - The yellow **Record** indicator is illuminated.

   - The message TEST: ARE ALL DOTS PRINTED? is printed followed by three vertical lines which appear continuous. Discontinuous lines are an indication of damaged printhead elements if gaps occur in the same place on all three lines. Simulated trends of 30, 120, and 240 BPM (or 50, 120, and 210 BPM for International paper) are printed on the heart rate channel. Simulated pressure trends at 0, 50, and 100 mmHg (0, 6.7, and 13.33 kPa) are printed on the UA channel (the values are also printed in the center margin of the strip chart). Refer to Figure 6-1.

- After the recorder test above, the software generates a 120 BPM rate on the Heart Rate #1 display and a 180 BPM rate on the Heart Rate #2 display. These rates are printed on the chart paper as a thin and thick trace, respectively, along with the numerical values with thin and thick trace symbols in the center margin of the paper. Refer to Figure 6-1.

- The monitor adds 50 mmHg (6.7 kPa) to the present pressure level; displays this value on the UA display; and prints this value on the recorder paper with the message INPUT +50 (INPUT +6.7) in the center margin. In other words, if a tocotransducer is connected and has a weight on it, the recorder will scribe a line at the weight plus 50 mmHg (plus 6.7 kPa). Refer to Figure 6-1.

NOTE: The monitor will add 50 mmHg (6.7 kPa) to raw pressure data. In other words, the value is always referenced to 0 mmHg (0 kPa) regardless of any UA referencing attempt.

4. The recorder will return to its original on or off state from when the **Test** pushbutton was depressed.

NOTE: To disable the test, depress the **Test** pushbutton or open the recorder door.

NOTE: If the simulated fetal heart rate trends do not appear in the correct positions on the strip chart recorder paper's heart rate channel (±1 BPM), ensure the monitor's vertical scale setting matches the type of paper being used, i.e. 30 BPM/cm or 20 BPM/cm.

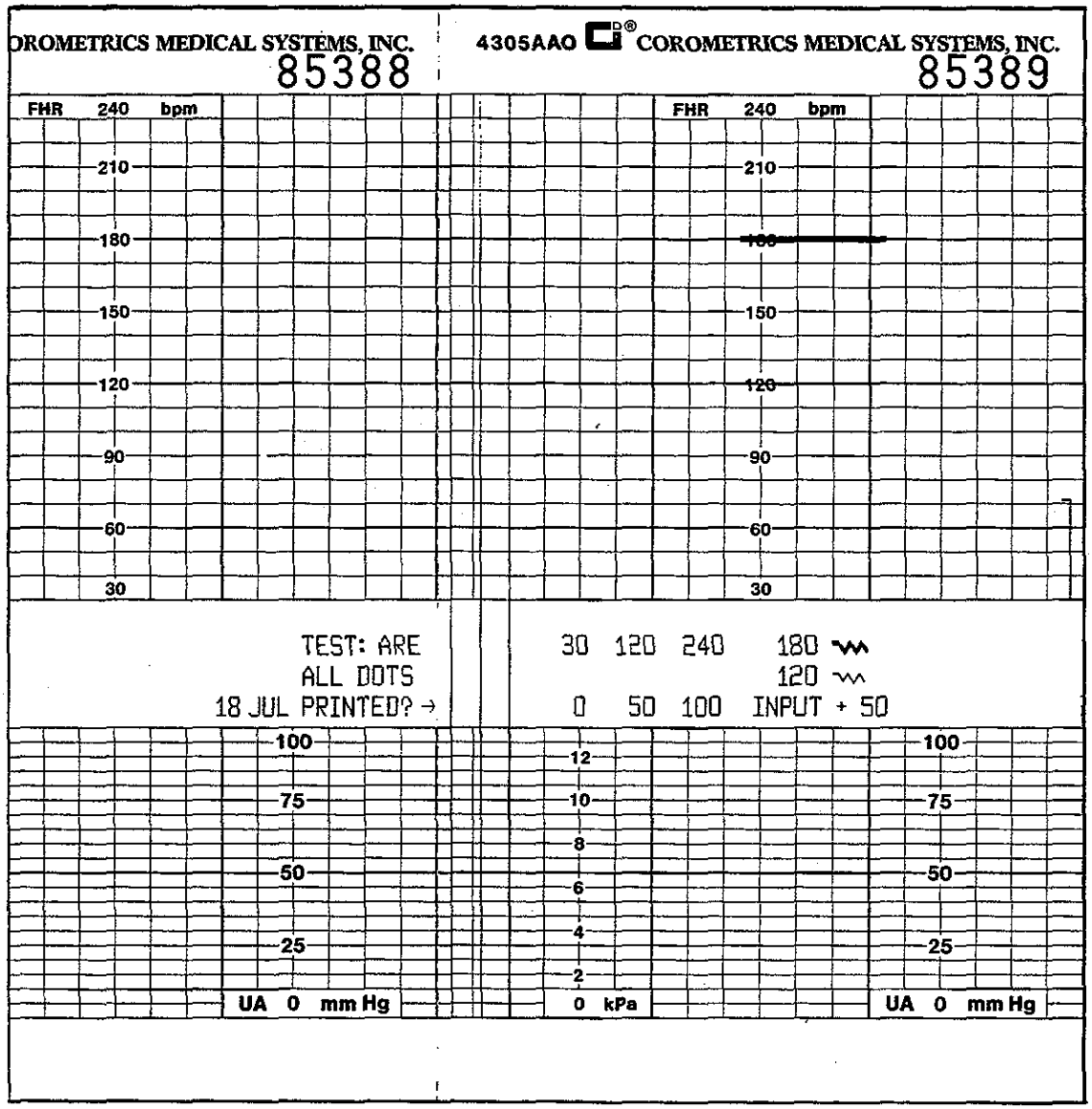

Figure 6-1. Model 118 Self-Test

FRONT PANEL PUSHBUTTON TEST

This test ensures the functionality of the front panel pushbuttons.

1. Apply power to the Model 118 Maternal/Fetal Monitor.

2. Disconnect all transducers from the front panel.

3. Place the Model 118 rear panel **Chart Speed** switch in the 1 cm/min position.

4. Depress the monitor's **Record** pushbutton and verify the following:

   - The yellow indicator above the pushbutton illuminates continuously.
   - The recorder paper advances at a rate of 1 cm/min.
   - The recorder prints the correct time and date information on the strip chart paper. (If an incorrect time or date is listed, refer to *Section 5, Setup Procedures* in this manual.)
   - The recorder prints the messages CARDIO INOP and UA INOP, indicating that no ultrasound, ECG, or uterine activity transducers are plugged into the front panel **Ultrasound, Ultrasound 2, ECG**, or **UA** connectors.
   - The recorder prints the message 1 CM/MIN, indicating the selected chart speed.

5. Depress and hold the monitor's front panel **Paper Advance** pushbutton and verify that the recorder paper advances at a rate of 50 cm/min and then 100 cm/min. Release the **Paper Advance** pushbutton and verify that the recorder prints the same messages as in step 4.

6. Place the monitor's rear panel **Chart Speed** switch in the 3 cm/min position and verify that the recorder paper advances at a rate of 3 cm/min and that after approximately 40 seconds, the message 3 CM/MIN is printed on the recorder paper. (The time, date and monitoring modes are also printed again.)

7. Depress the monitor's front panel **Mark** pushbutton and verify that the remote event marker ↑ is printed between the 30 BPM and 50 BPM markings on the recorder paper.

ECG TEST

This portion of the functional checkout procedure ensures the integrity of the ECG circuitry and the heart rate channel of the recorder.

1. Connect the Model 305 Simulator's power cord to the power receptacle on the rear panel of the simulator; plug the other end of the power cord into a properly grounded wall outlet of appropriate voltage. Connect the simulator interconnect cable's 50-pin end to the J103 receptacle on the simulator. Connect the white 12-pin uterine activity connector cable to the white **UA** receptacle on the front panel of the Model 118. Connect the gray 12-pin ECG connector cable to the gray **ECG** receptacle on the front panel of the Model 118. Apply power to the Model 305 Simulator by depressing the **Power** pushbutton on the rear panel of the simulator and verify that the front panel green power indicator is continuously illuminated.

2. Set the switches on the Model 305 Input Simulator according to Table 6-1.

3. If not already on, depress the monitor's **Power** pushbutton.

4. If not already on, depress the monitor's **Record** pushbutton.

5. Turn the simulator's **Manual Adjustment knob** fully counterclockwise and verify the following on the monitor's EL display:

   - The Heart Rate #1 Value is 30 BPM.
   - The Heart Rate #1 Mode is FECG.
   - The Heart Rate #1 Heartbeat Indicator ♥ flashes at a rate of 120 times per minute.
   - The Uterine Activity Value may be a negative number.
   - The Uterine Activity Mode is TOCO.

6. Momentarily depress the monitor's **UA Reference** pushbutton and verify the following on the monitor:

   - The Uterine Activity Value is referenced to 10 relative units.
   - The recorder prints a continuous line at 10 mmHg on the pressure channel of the strip chart paper.
   - The recorder prints the messages FECG_∧∧, TOCO, and UA REF on the center margin of the strip chart paper.

Table 6-1. ECG Test — Model 305 Simulator Settings

SECTION	SWITCH	SETTING
FECG/MECG/ABD(FECG)	Main	RATE
	Rate	MANUAL
	Mode	FECG
	QRS Amplitude	15 µV
	QRS Polarity	+
MISCELLANEOUS	Pattern Memory	OFF
UA	Main	CMR
	Mode	TOCO

6. Turn the simulator's **Manual Adjustment** knob to input an internal fetal ECG signal at approximately 120 BPM. Verify the following on the monitor:

   - The Heart Rate #1 Value is 120 BPM.
   - The Heartbeat Indicator ♥ flashes at a rate of 120 times per minute.
   - The ECG "beep" volume of the rear panel speaker can be increased or decreased using the left pair of **Volume** △ ▽ pushbuttons. (Set the volume to the desired level.)
   - The recorder prints a continuous line at 120 BPM on the heart rate channel of the strip chart paper.

7. Repeat step 6 for each of the following rates: 30, 60, 210, and 240 BPM.

8. Change the **QRS Polarity** switch from + to –. Verify that the monitor does not skip any beats.

9. Place the simulator's FECG/MECG/ABD(FECG) **Rate** switch on the RAMP setting. Verify that the monitor's Heart Rate #1 Value counts between approximately 30 and 240 BPM and that the recorder prints a ramp between the same values. (Refer to Figure 6-2.)

10. Place the monitor's **ECG Artifact Elimination** switch in the OFF position.

11. Set the simulator's FECG/MECG/ABD(FECG) **Rate** switch to the Δ15 position. Verify the following on the monitor:

    - The Heart Rate #1 Value oscillates by 15 BPM.
    - The Heart Rate #1 Heartbeat Indicator ♥ flashes for each input signal.
    - The ECG "beep" is heard from the rear panel speaker.
    - The recorder prints an oscillation of 15 BPM between 115 and 130 BPM on the heart rate channel of the strip chart paper. (Refer to Figure 6-3.)

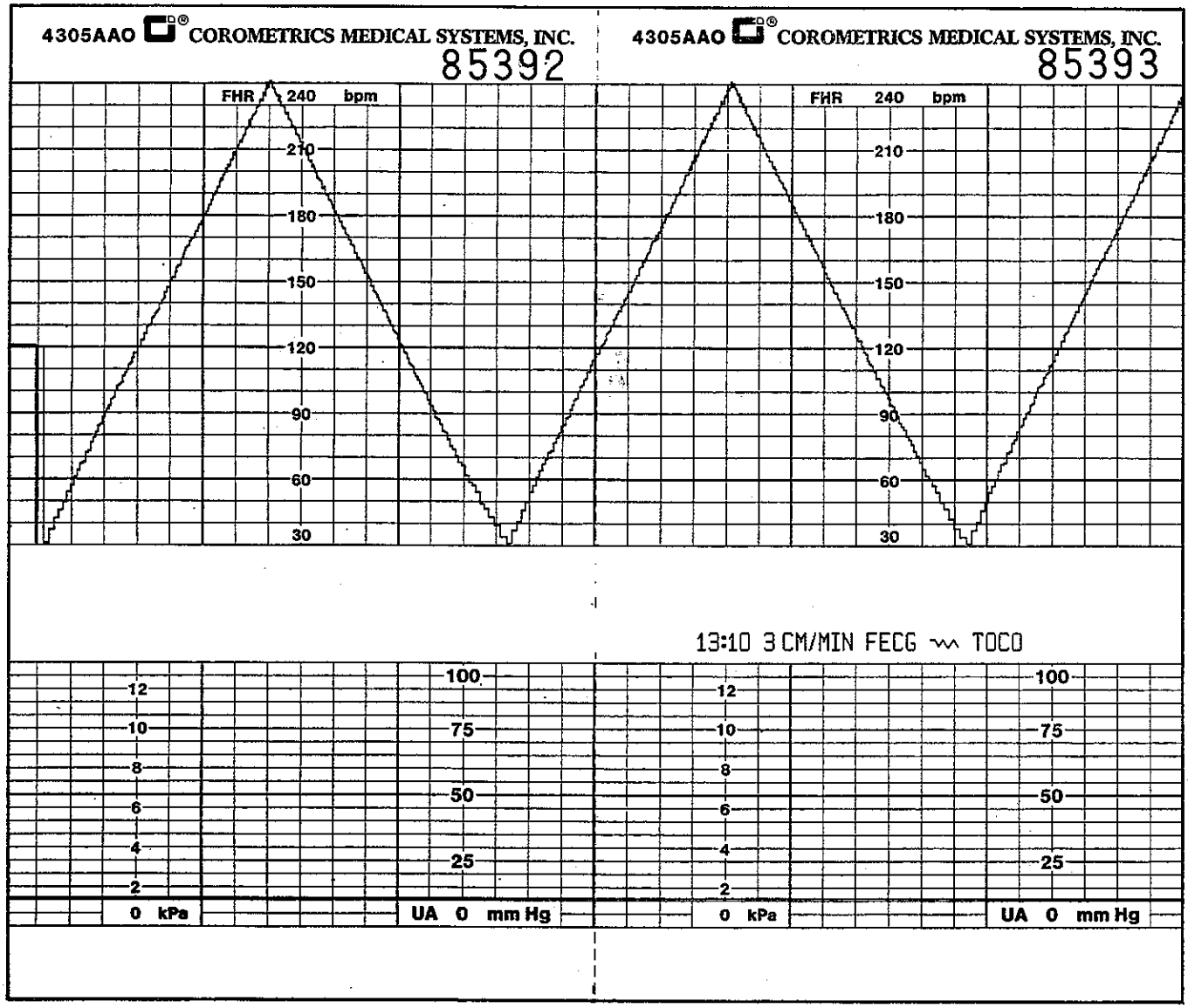

Figure 6-2. ECG Ramp

12. Repeat step 11 for rate values of Δ22 and Δ27. The results should be the same except that the Heart Rate #1 Value oscillates by either 22 or 27 BPM and the recorder prints an oscillation of 22 or 27 BPM. The top value is always at approximately 130 BPM. (Refer to Figure 6-3.)

13. Place the monitor's **ECG Artifact Elimination** switch in the ON position.

14. Again, set the simulator's FECG/MECG/ABD(FECG) **Rate** switch to the Δ15 position. Verify the following on the monitor:

    - The Heart Rate #1 Value oscillates by 15 BPM.
    - The Heart Rate #1 Heartbeat Indicator ♥ flashes for each input signal.
    - The ECG "beep" is heard from the rear panel speaker.
    - The recorder prints an oscillation of 15 BPM between 115 and 130 BPM on the heart rate channel of the strip chart paper. (Refer to Figure 6-3.)

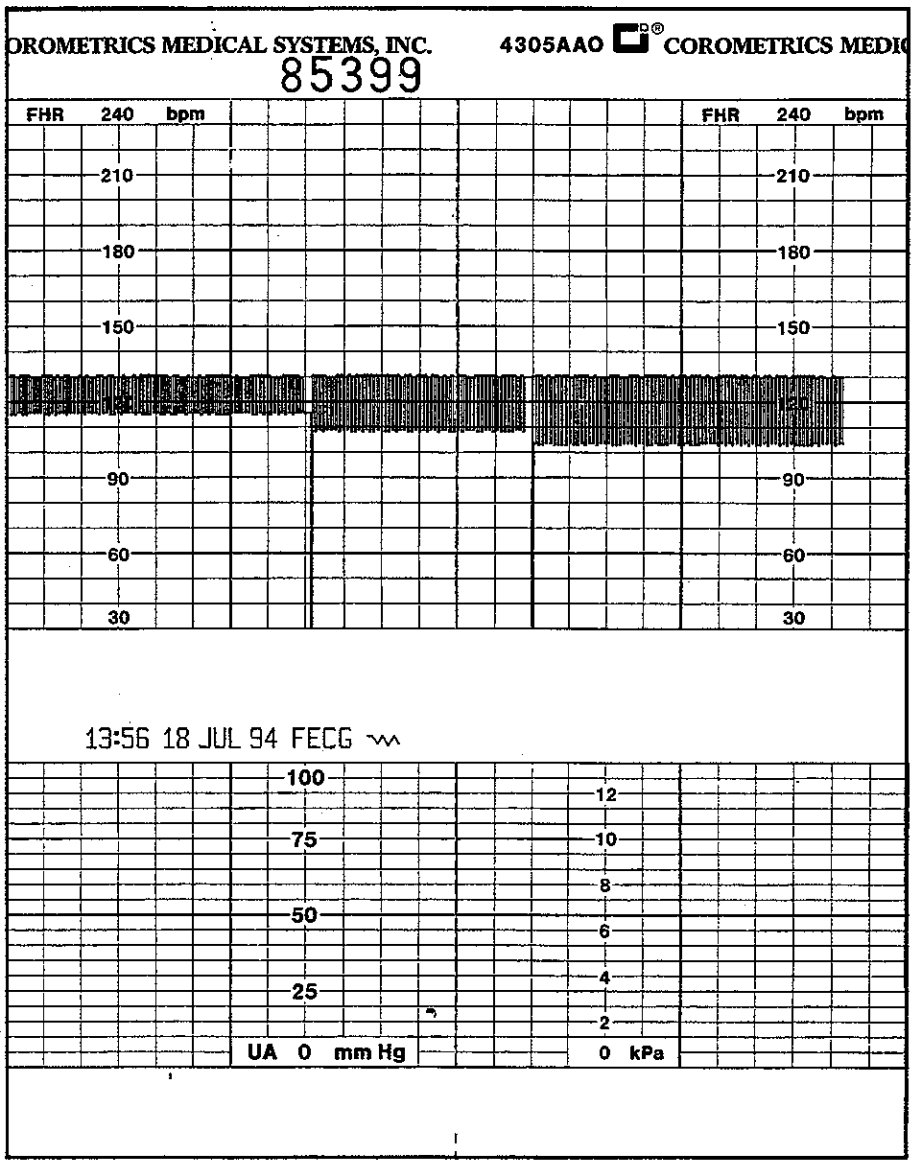

Figure 6-3. ECG Artifact Elimination

15. Repeat step 13 for the rate value of Δ22. The result should be the same as step 13 except that the Heart Rate #1 Value oscillates by 22 BPM and the recorder prints an oscillation of 22 BPM between the 108 and 130 BPM on the strip chart recorder paper.

16. Finally, set the simulator's FECG/MECG/ABD(FECG) **Rate** switch to the Δ27 position. Verify the following on the monitor:

    - The Heart Rate #1 Value oscillates by 27 BPM.
    - The Heart Rate #1 Heartbeat Indicator ♥ flashes for each input signal.
    - The ECG "beep" is heard from the rear panel speaker.
    - The recorder ***does not print*** any oscillation.

17. Return the monitor's **ECG Artifact Elimination** switch to the OFF position.

18. Set the simulator's FECG/MECG/ABD(FECG) **Rate** switch to the MANUAL position and the **Manual Adjustment** knob to the fully counterclockwise position. Disconnect the ECG simulator cable from the front panel of the Model 118. Verify the following on the monitor:

    - The Heart Rate #1 Area is blank for both Value and Mode.
    - The recorder stops printing heart rate data on the strip chart paper.
    - The recorder prints the message CARDIO INOP on the center margin of the strip chart paper after approximately 30 seconds.

19. Set the simulator's FECG/MECG/ABD(FECG) **Mode** switch to the OFF position.

LEGPLATE TEST

1. If not already on, depress the monitor's **Power** pushbutton.

2. If not already on, depress the monitor's **Record** pushbutton.

3. Inspect the Model 116/118 Legplate Transducer as follows:

    - Check for a proper seal around the ground plate.
    - Ensure that no contaminants are present on either the ground plate or the push posts.
    - Visibly assess the condition of the cable, strain relief, and connector pins.

4. Connect the legplate connector to the **ECG** input receptacle on the monitor's front panel; attach the legplate to the monitor's **Legplate Tester** jack and hold firmly against the rear panel of the monitor. Verify the following on the monitor:

    - The Heart Rate #1 Value is 120 BPM.
    - The Heart Rate #1 Mode is FECG.
    - The Heart Rate #1 Heartbeat Indicator ♥ flashes at a rate of 120 times per minute.
    - The ECG "beep" is heard coming from the rear panel speaker.
    - The recorder prints a continuous line on the heart rate channel of the strip chart paper at 120 BPM.
    - The recorder prints the message FECG⎍ on the center margin of the strip chart paper after approximately 20 seconds, indicating that a legplate has been connected.

5. Disconnect the legplate from the Model 118. Verify the following on the monitor:

    - The Heart Rate #1 Area is blank for both Value and Mode.
    - The recorder stops printing the heart rate trace.
    - The message CARDIO INOP prints on the center margin of the strip chart paper after approximately 20 seconds, indicating that there is no ECG (or ultrasound) transducer plugged into the front panel of the monitor.

ULTRASOUND TEST

This portion of the functional checkout procedure ensures the integrity of the ultrasound circuitry and the heart rate channel of the recorder.

1. Connect the Model 305 Simulator's power cord to the power receptacle on the rear panel of the simulator; plug the other end of the power cord into a properly grounded wall outlet of appropriate voltage. Connect the simulator interconnect cable's 50-pin end to the J103 receptacle on the simulator. Connect the white 12-pin uterine activity connector cable to the white **UA** receptacle on the front panel of the Model 118. Connect the light gray 12-pin ultrasound connector cable to the light gray **Ultrasound** or **Ultrasound 2** receptacle on the front panel of the Model 118. Apply power to the Model 305 Simulator by depressing the **Power** pushbutton on the rear panel of the simulator and verify that the front panel green power indicator is continuously illuminated.

2. Set the switches on the Model 305 Input Simulator according to Table 6-2.

3. If not already on, depress the monitor's **Power** pushbutton.

4. If not already on, depress the monitor's **Record** pushbutton.

5. Turn the simulator's **Manual Adjustment** knob to input an ultrasound signal at approximately 120 BPM. Verify the following on the monitor:

   - The Heart Rate #1 Value is 120 BPM.
   - The Heart Rate #1 Mode is US.
   - The Heart Rate #1 Heartbeat Indicator ♥ flashes at a rate of 120 times per minute.
   - Ultrasound audio volume from the rear panel speaker can be increased or decreased using the left pair of **Volume** △ ▽ pushbuttons. (Set the volume to the desired level.)
   - The recorder prints a continuous line at 120 BPM on the heart rate channel of the strip chart paper.
   - The recorder prints the message US on the center margin of the strip chart paper after approximately 20 seconds.

6. Use the simulator's **Manual Adjustment** knob to *increase* the heart rate value by *less than 13 BPM from the 120 BPM baseline*. Verify the following on the monitor:

   - The Heart Rate #1 Value immediately reflects this new input rate.
   - The strip chart recorder immediately reflects this new input rate.

Table 6-2. Ultrasound Test — Model 305 Simulator Settings

SECTION	SWITCH	SETTING
PHONO/ULTRASOUND/ABD(MECG)	Mode	US/ABD
	Signal Level	MED
	Rate	MANUAL
MISCELLANEOUS	Pattern Memory	OFF
UA	Main	CMR
	Mode	TOCO

7. Use the simulator's **Manual Adjustment** knob to *decrease* the heart rate value by *more than 13 BPM from the 120 BPM baseline*. Verify the following on the monitor:

   - The Heart Rate #1 Value immediately reflects this new input rate.
   - The strip chart recorder prints at the last input rate for an additional 3 seconds before blanking the heart rate data and printing a continuous line at the new input rate.

8. Set the simulator's PHONO/ULTRASOUND/ABD(MECG) **Rate** switch to the RAMP position. Verify that the Heart Rate #1 Value counts between approximately 50 and 210 BPM and that the recorder prints a ramp between the same values. (Refer to Figure 6-4.)

9. Place the simulator's PHONO/ULTRASOUND/ABD(MECG) **Rate** switch in each of the individual rate settings (50, 60, 120, and 210 BPM). Verify the following on the monitor:

   - The Heart Rate #1 Value reflects the simulator setting ± 1 BPM.
   - The Heart Rate #1 Heartbeat Indicator ♥ flashes at the simulator setting.
   - Ultrasound audio is heard coming from the rear panel speaker.
   - The recorder prints a continuous line at the respective value ± 3 BPM on the heart rate channel of the strip chart paper.

10. Repeat steps 5 through 9 using the second ultrasound channel.

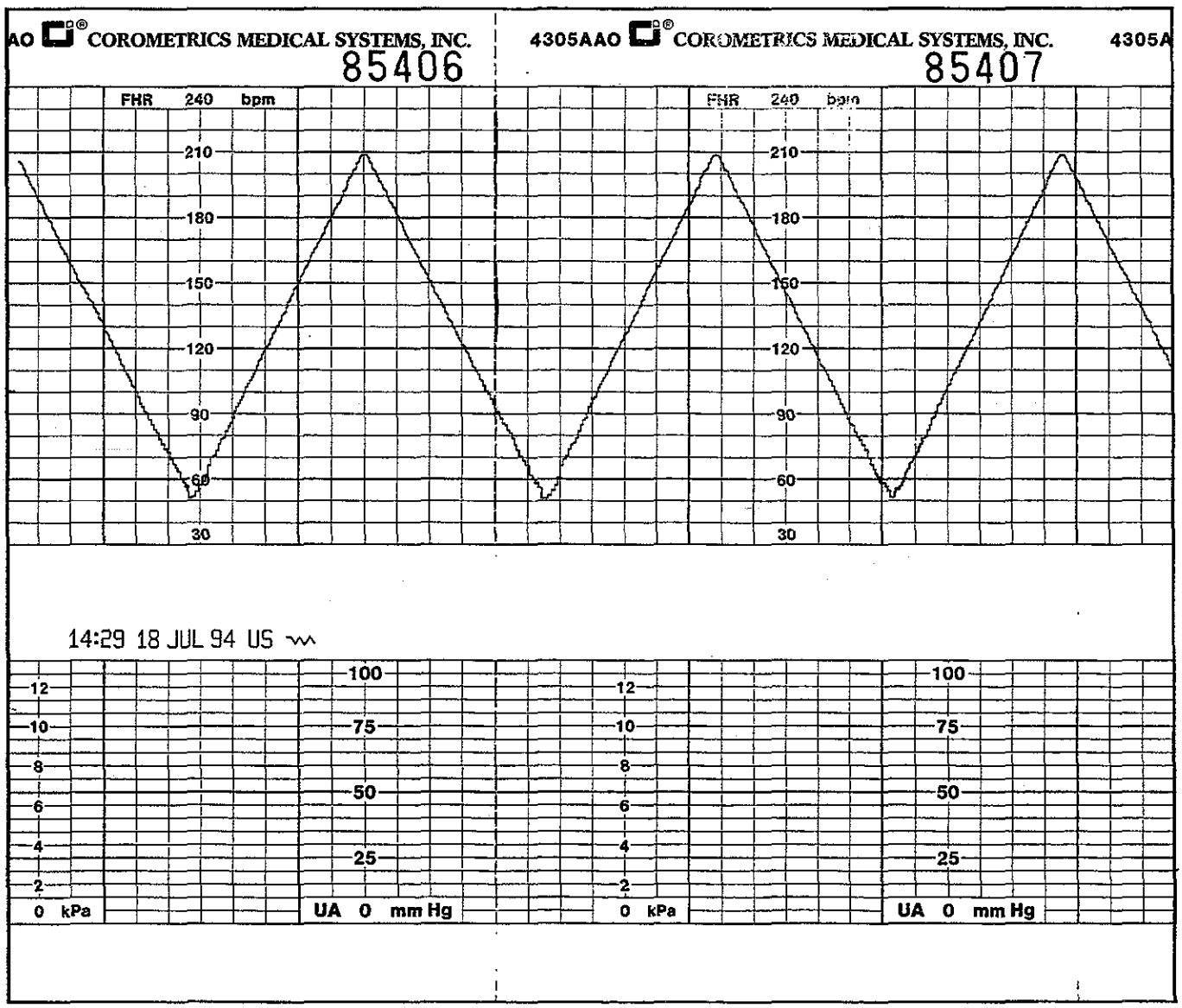

Figure 6-4. Ultrasound Ramp

11. Place the simulator's PHONO/ULTRASOUND/ABD(MECG) **Mode** switch in the OFF position. Verify the following on the monitor:

    - The Heart Rate #1 Area is blank for both Value and Mode.
    - The recorder stops printing the heart rate trace.
    - The recorder prints the message CARDIO INOP on the center margin of the strip chart paper after approximately 20 seconds.

ULTRASOUND TRANSDUCER TEST

1. Inspect a Model 116/118 ultrasound transducer as follows:

    - Ensure there are no cracks around the transducer face.
    - Visibly assess the condition of the cable, strain relief, and connector pins.

2. Disconnect the simulator's ultrasound cable from the front panel of the Model 118.

3. Connect the ultrasound transducer to either the **Ultrasound** or **Ultrasound 2** input receptacle on the front panel of the Model 118. Verify the following on the monitor:

    - The Heart Rate #1 Value shows three steady dashes "– – –."
    - The Heart Rate #1 Mode is US.
    - The recorder prints the message US⎍⎍ on the center margin of the strip chart paper after approximately 20 seconds.

4. Gently rub each crystal of the ultrasound transducer rhythmically. (There are nine crystals. Eight are arranged around the circumference of the transducer; one is in the center.) Verify the following:

    - Good sensitivity is apparent.
    - The monitor's Heart Rate #1 Value follows the input rate.
    - The monitor's recorder follows the input rate.
    - The monitor's Heart Rate #1 Heartbeat Indicator ♥ flashes for each input.
    - The Heart Rate #1 Mode shows US.
    - Ultrasound audio is heard coming from the monitor's rear panel speaker.

5. Disconnect the ultrasound transducer from the front panel of the Model 118. Verify the following on the monitor:

    - The Heart Rate #1 Area is blank for Value, Mode, and Heartbeat Indicator.
    - The recorder stops printing the heart rate trace.
    - The recorder prints the message CARDIO INOP on the center margin of the strip chart paper after approximately 20 seconds.

UTERINE ACTIVITY TEST

This portion of the functional checkout procedure tests the uterine activity* section of the Model 118.

1. Connect the Model 305 Simulator's power cord to the power receptacle on the rear panel of the simulator; plug the other end of the power cord into a properly grounded wall outlet of appropriate voltage. Connect the simulator interconnect cable's 50-pin end to the J103 receptacle on the simulator. Connect the white 12-pin uterine activity connector cable to the white **UA** receptacle on the front panel of the Model 118. Apply power to the Model 305 Simulator by depressing the **Power** pushbutton on the rear panel of the simulator and verify that the front panel green power indicator is continuously illuminated.

2. Set the switches on the Model 305 Input Simulator according to Table 6-3.

3. If not already on, depress the monitor's **Power** pushbutton.

4. If not already on, depress the monitor's **Record** pushbutton.

5. Depress the **UA Reference** pushbutton on the Model 118. Verify the following on the monitor:

    - The Uterine Activity Value is 10 relative units.
    - The Uterine Activity Mode is TOCO.
    - The recorder prints a continuous line at 10 relative units on the uterine activity channel of the strip chart paper.
    - The recorder prints the message TOCO on the center margin of the strip chart paper.

---

* *The uterine activity functional checkout procedure assumes the Model 118 is configured to display uterine activity in mmHg, not kPa.*

Table 6-3. Uterine Activity Test — Model 305 Simulator Settings

SECTION	SWITCH	SETTING
MISCELLANEOUS	Pattern Memory	OFF
UA	Main	LEVEL
	Level	0 mmHg
	Mode	TOCO

6. Depress and hold the **UA Reference** pushbutton on the monitor to cycle through the available selections for UA reference: 5, 10, 15, 20, or 25 relative units. Test each of these reference settings. Verify that the Uterine Activity Value is displayed accordingly and that the recorder prints a continuous line at the corresponding value on the uterine activity channel of the strip chart paper.

7. Place the simulator's **Level** switch at each of the level settings: 0, 10, 50, and 100 relative units. Verify that the Uterine Activity Value is displayed accordingly and that the recorder prints a continuous line at the corresponding value on the heart rate channel of the strip chart paper.

8. Place the simulator's **Mode** switch in the IUP position and the **Level** switch to 0 mmHg. Depress the monitor's **UA Reference** pushbutton and verify that the monitor and recorder reference to 0 mmHg. Verify the following on the monitor:

   - The Uterine Activity Value is 0 mmHg.
   - The Uterine Activity Mode is IUP.
   - The recorder prints a continuous line at 0 mmHg on the uterine activity channel of the strip chart paper.
   - The recorder prints the messages IUP and UA REF on the center margin of the strip chart paper.

9. Place the simulator's **Level** switch at each of the level settings: 0, 10, 50, and 100 mmHg. Verify that the Uterine Activity Value is displayed accordingly and that the recorder prints a continuous line at the corresponding value on the uterine activity channel of the strip chart paper.

10. Place the simulator's **Level** switch to the RAMP position. Verify that the Uterine Activity Value measures between approximately 0 and 100 mmHg and that the recorder prints a ramp between the same values. Refer to Figure 6-5.

11. Disconnect the Model 305 simulator's uterine activity cable from the **UA** input receptacle on the front panel of the Model 118. Verify the following on the monitor:

    - The Uterine Activity Area is blank for both Value and Mode.
    - The recorder stops printing the uterine activity trace.
    - The recorder prints the message UA INOP on the center margin of the strip chart paper after approximately 20 seconds.

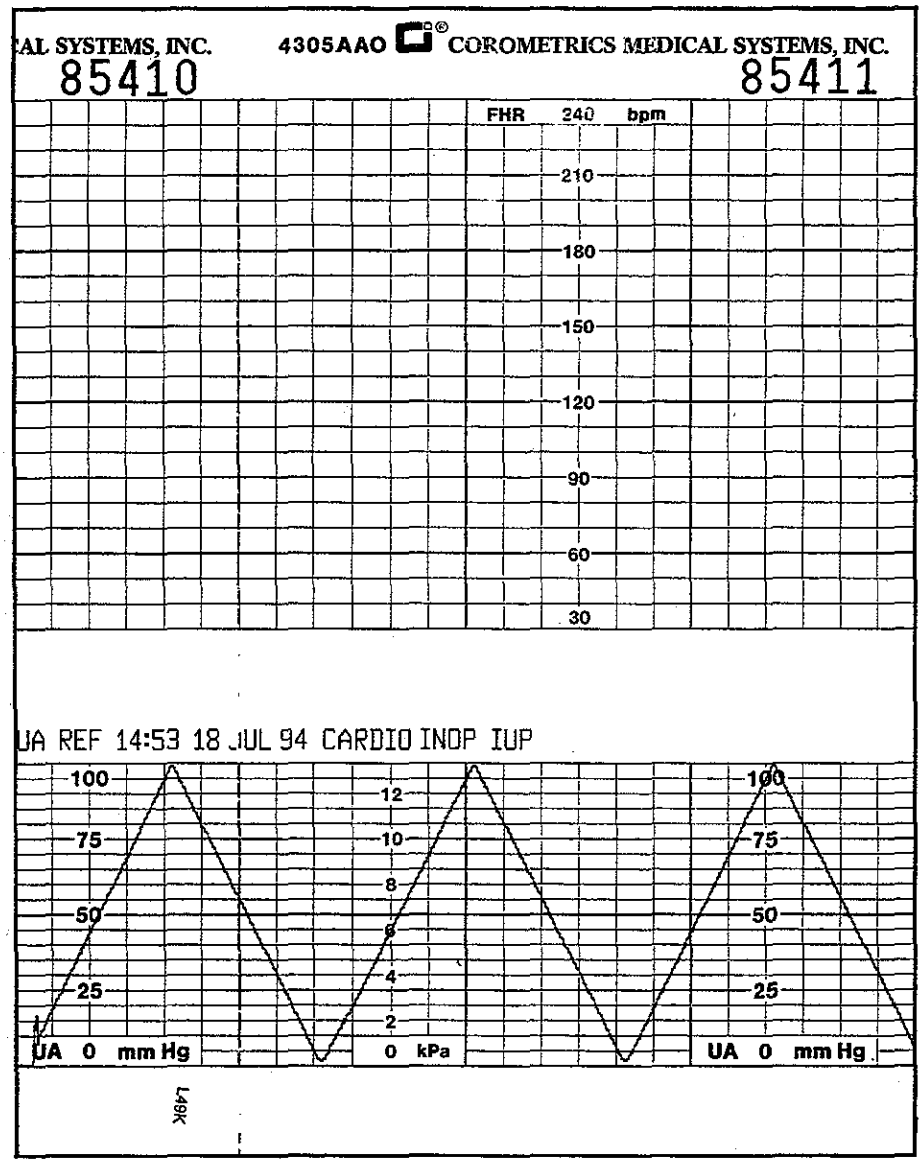

Figure 6-5. Uterine Activity Ramp

TOCOTRANSDUCER TEST

1. Inspect a Model 116/118 tocotransducer as follows:

   - Check for any cracks or contaminants on the tocotransducer especially on the diaphragm located on the bottom of the tocotransducer.
   - Visibly assess the condition of the cable, strain relief, and connector pins.

2. Connect the tocotransducer to the **UA** input receptacle on the front panel of the Model 118.

3. Momentarily depress the monitor's **UA Reference** pushbutton. Verify the following:

   - The Uterine Activity Value shows 10 relative units.
   - The Uterine Activity Mode shows TOCO.
   - The recorder prints the messages UA REF and TOCO on the center margin of the strip chart paper.

4. Apply gentle pressure to the tocotransducer diaphragm and verify that the Uterine Activity Value responds to the pressure input. Increasing force should produce an increasing value and vice versa.

5. Remove the tocotransducer from the monitor's **UA** input receptacle on the front panel of the Model 118. Verify the following on the monitor:

   - The Uterine Activity Area on the display are blank for both Value and Mode.
   - The recorder stops printing the uterine activity trace.
   - The recorder prints the message UA INOP on the center margin of the strip chart paper after approximately 20 seconds.

STRAIN GAUGE TRANSDUCER TEST

1. Inspect a Model 116/118 strain gauge as follows:

   - Unscrew the plastic dome from the transducer and check for any cracks or contaminants on the transducer.
   - Visibly assess the condition of the cable, strain relief, and the connector pins.

2 Connect the strain gauge to the **UA** input receptacle on the front panel of the Model 118. Verify the following on the monitor:

   - The Uterine Activity Value may read negative numbers indicating baseline pressure is off scale.
   - The Uterine Activity Mode is IUP for intrauterine pressure.
   - The recorder prints the message IUP on the center margin of the strip chart paper after approximately 20 seconds.
   - The recorder prints the message BASELINE PRESSURE OFF SCALE on the center margin of the strip chart paper.

3. Depress the monitor's **UA Reference** pushbutton and verify the following on the monitor:

   - The Uterine Activity Value is 0 mmHg.
   - The recorder prints a continuous line at 0 mmHg on the strip chart paper.
   - The recorder prints the message UA REF on the center margin of the strip chart paper.

4. Apply gentle pressure on the strain gauge diaphragm and verify that the display and recorder respond to the input. Increasing force should produce an increasing value and vice versa.

5. Disconnect the strain gauge from the front panel of the Model 118. Verify the following on the monitor:

   - The Uterine Activity Area is blank for both Value and Mode.
   - The recorder stops printing the uterine activity trace.
   - The recorder prints the message UA INOP on the center margin of the strip chart paper after approximately 20 seconds.

PATTERN MEMORY TEST

The pattern memory of the simulator can be used to test any of the following mode combinations of the monitor.

- FECG/TOCO
- FECG/IUP
- MECG/TOCO
- MECG/IUP
- US/TOCO
- US/IUP
- US2/TOCO
- US2/IUP
- FECG/US/TOCO
- FECG/US/IUP
- FECG/US2/TOCO
- FECG/US2/IUP
- MECG/US/TOCO
- MECG/US/IUP
- MECG/US2/TOCO
- MECG/US2/IUP

NOTE: US/US2 cannot be tested simultaneously unless two simulators or two Model 116/118 ultrasound transducers are used. ***Do not*** attempt to test dual ultrasound using one Model 305 Simulator and one ultrasound transducer or a conflict between enable lines will occur.

NOTE: Although dual heart rate can be verified using the pattern memory, an additional procedure is given in this functional checkout procedure.

To check these mode combinations:

1. Connect the Model 305 Simulator's power cord to the power receptacle on the rear panel of the simulator; plug the other end of the power cord into a properly grounded wall outlet of appropriate voltage. Connect the simulator interconnect cable's 50-pin end to the J103 receptacle on the simulator. Connect the appropriate simulator cable(s) to the corresponding input receptacle(s) on the front panel of the Model 118. Apply power to the Model 305 Simulator by depressing the **Power** pushbutton on the rear panel of the simulator and verify that the front panel green power indicator is continuously illuminated.

2. Enable the modes on the simulator.

3. Set the simulator's **Pattern Memory** switch to the ON position.

4. If not already on, depress the monitor's **Power** pushbutton.

5. If not already on, depress the monitor's **Record** pushbutton.

6. For single heart rate modes, verify the following on the monitor:

   - The Heart Rate #1 Area responds accordingly for Value, Mode, and Heartbeat Indicator ♥ .
   - The Uterine Activity Area responds accordingly for Value and Mode.
   - The recorder responds appropriately in both trending and message information.

   For dual heart rate modes, verify the following on the monitor:

   - The Heart Rate #1 Area responds accordingly for Value, Mode and Heartbeat Indicator ♥ .
   - The Heart Rate #2 Area responds accordingly for Value, Mode, and Heartbeat Indicator ♥ .
   - The Uterine Activity Area responds accordingly for Value and Mode.
   - The recorder responds appropriately for both trending and message information. Verify that for the heart rate tracings, one is printed in a 1-dot width intensity and the other in a 3-dot width intensity. (Refer to Figure 6-6.)

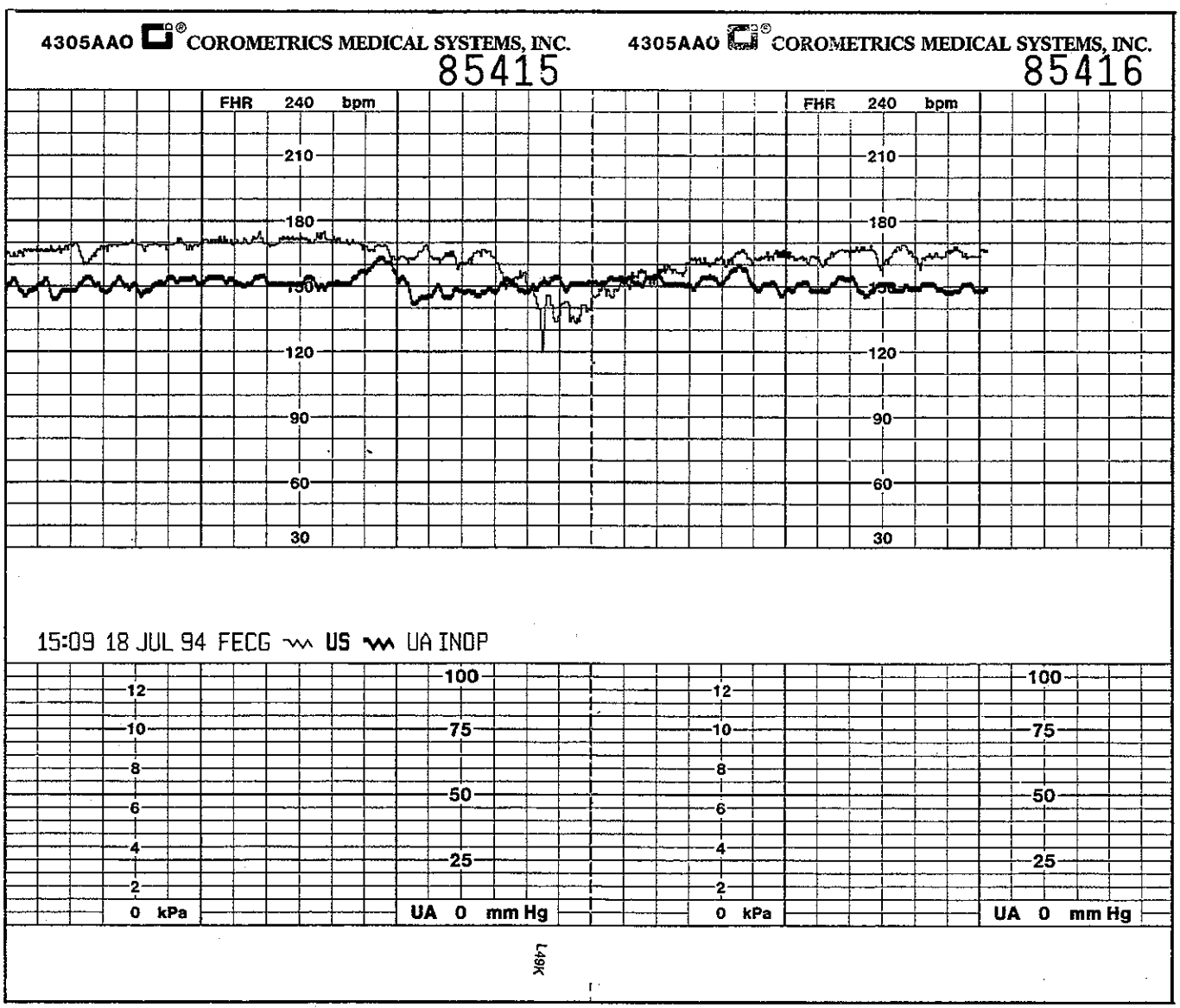

Figure 6-6. Dual Heart Rate Pattern Memory

DUAL HEART RATE TEST (NON-PATTERN)

FECG/US Modes

1. Connect the Model 305 Simulator's power cord to the power receptacle on the rear panel of the simulator; plug the other end of the power cord into a properly grounded wall outlet of appropriate voltage. Connect the simulator interconnect cable's 50-pin end to the J103 receptacle on the simulator. Connect the light gray 12-pin ultrasound connector cable to the light gray **Ultrasound** or **Ultrasound 2** input receptacle on the front panel of the Model 118. Connect the gray 12-pin ECG connector cable to the gray **ECG** receptacle on the front panel of the Model 118. Apply power to the Model 305 Simulator by depressing the **Power** pushbutton on the rear panel of the simulator and verify that the front panel green power indicator is continuously illuminated.
2. Set the switches on the Model 305 Input Simulator according to Table 6-4.

Table 6-4. FECG/US Test — Model 305 Simulator Settings

SECTION	SWITCH	SETTING
FECG/MECG/ABD(FECG)	Main	RATE
	Rate	120 bpm
	Mode	FECG
	QRS Amplitude	50 μV
	QRS Polarity	+
PHONO/ULTRASOUND/ABD(MECG)	Mode	US/ABD
	Signal Level	MED
	Rate	RAMP
MISCELLANEOUS	Pattern Memory	OFF

3. If not already on, depress the monitor's **Power** pushbutton.

4. If not already on, depress the monitor's **Record** pushbutton.

5. Verify the following on the monitor:

   - The Heart Rate #1 Value reads 120 BPM.
   - The Heart Rate #1 Mode reads FECG.
   - The Heart Rate #1 Heartbeat Indicator ♥ flashes at a rate of 120 times per minute.
   - The Heart Rate #2 Value varies between approximately 50 and 210 BPM.
   - The Heart Rate #2 Mode reads US.
   - The Heart Rate #2 Heartbeat Indicator ♥ flashes at a rate consistent with the Value.
   - The recorder prints the messages FECG and US on the center margin of the strip chart paper.
   - The recorder prints a continuous line of 1-dot width intensity on the 120 BPM mark on the heart rate channel of the strip chart paper. (Refer to Figure 6-7.)
   - The recorder prints a ramp trace of 3-dot width intensity between 50 and 210 BPM on the heart rate channel of the strip chart paper. (Refer to Figure 6-7.)

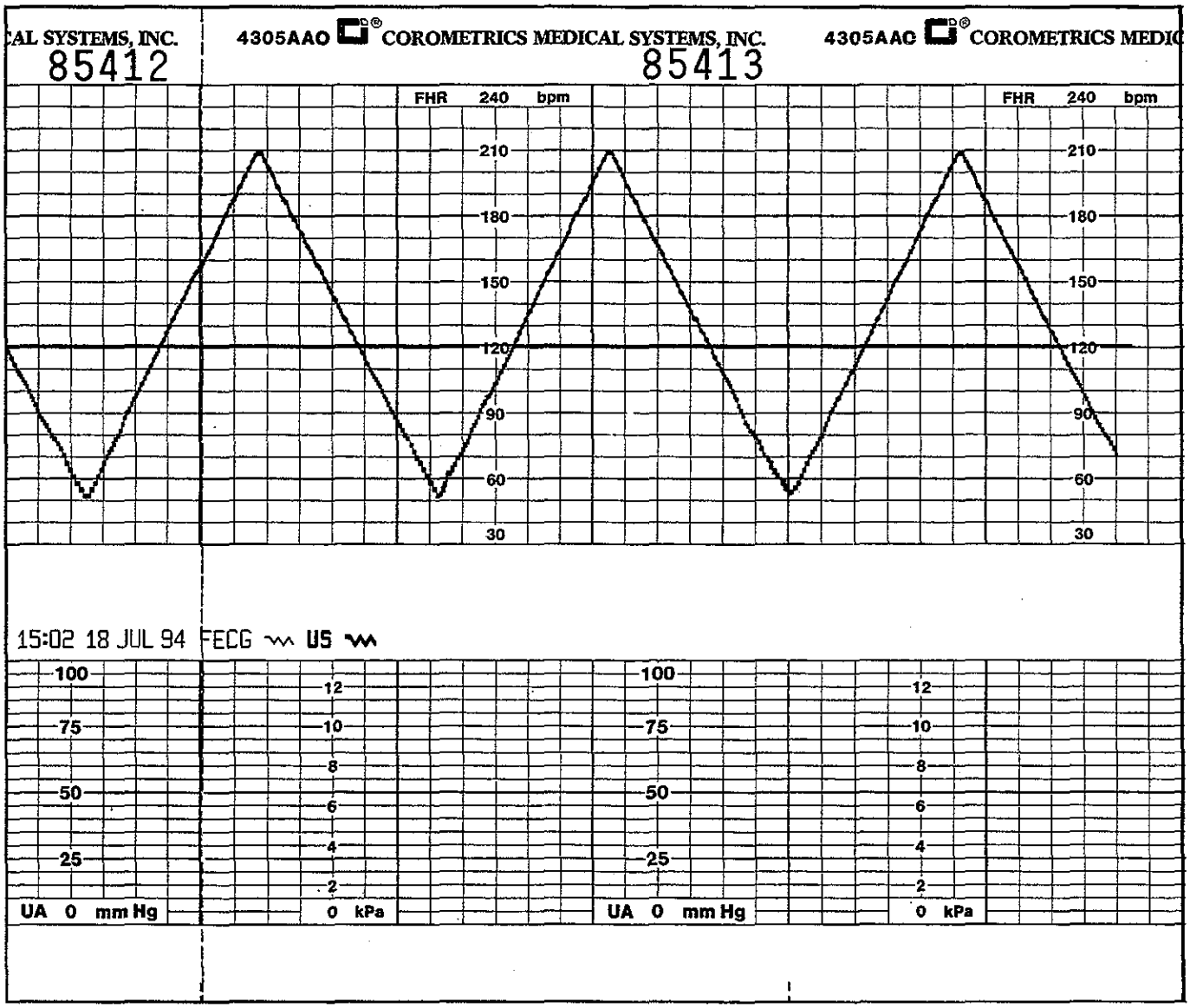

Figure 6-7. Dual Heart Rate, FECG and US.

Dual Ultrasound Modes

As stated above, the dual ultrasound mode of the Model 118 cannot be tested unless two simulators are used or two Model 116/118 ultrasound transducers. DO NOT attempt to test dual ultrasound using one Model 305 Simulator and one ultrasound transducer. This procedure details using two transducers since it is more practical for a test site.

1. If not already on, depress the monitor's **Power** pushbutton.

2. If not already on, depress the monitor's **Record** pushbutton.

3. Plug one ultrasound transducer into the monitor's **Ultrasound** input receptacle and the other into the monitor's **Ultrasound 2** receptacle. Verify the following on the monitor:

   - The Heart Rate #1 Mode shows US.
   - The Heart Rate #2 Mode shows US2.
   - The Heart Rate #1 Value shows three steady dashes "---."
   - The Heart Rate #2 Value shows three steady dashes "---."
   - The recorder prints the messages US and US2 on the center margin of the strip chart paper.

4. Use your finger to rub the face of the ultrasound transducer connected to the monitor's **Ultrasound** input receptacle; try to maintain a steady rate and verify the following on the monitor:

   - The Heart Rate #1 Value responds to the rubbing.
   - The Heart Rate #1 Heartbeat Indicator ♥ responds to the input.
   - The recorder prints the heart rate tracing corresponding to the rate and the trace has a 1-dot width intensity.

5. Use your finger to rub the face of the ultrasound transducer connected to the monitor's **Ultrasound 2** input receptacle; try to maintain a steady rate and verify the following on the monitor:

   - The Heart Rate #2 Value responds to the rubbing.
   - The Heart Rate #2 Heartbeat Indicator ♥ responds to the input.
   - The recorder prints the heart rate tracing corresponding to the rate and the trace has a 3-dot width intensity.

ALARM TEST

This portion of the test ensures the integrity of the audio alarms and tests the alarm limit software.

1. If not already on, depress the monitor's **Power** pushbutton.

2. Depress the monitor's **Setup** pushbutton twice to display Setup Menu #2.

3. Depress the **Select** pushbutton until the cursor is in the MECG Audio Alarm field.

4. Use the △ ▽ keys to configure the MECG Audio Alarm to ON.

5. Depress the **Select** pushbutton until the cursor is in the Pulse High Alarm Limit field.

6. Use the △ ▽ keys to set the value to 120 bpm.

7. Depress the **Select** pushbutton until the cursor is in the Pulse Low Alarm Limit field.

8. Use the △ ▽ keys to set the value to 60 bpm.

9. Depress the **Select** pushbutton until the cursor is in the Re-Alarm Time field.

10. Use the △ ▽ keys to set the value to 30 seconds.

11. Depress the **Setup** pushbutton to return to the monitor to normal operation.

12. Connect the Model 305 Simulator's power cord to the power receptacle on the rear panel of the simulator; plug the other end of the power cord into a properly grounded wall outlet of appropriate voltage. Connect the simulator interconnect cable's 50-pin end to the J103 receptacle on the simulator. Connect the gray 12-pin ECG connector cable to the gray **ECG** receptacle on the front panel of the Model 118. Apply power to the Model 305 Simulator by depressing the **Power** pushbutton on the rear panel of the simulator and verify that the front panel green power indicator is continuously illuminated.

13. Set the switches on the Model 305 Input Simulator according to Table 6-5.

Table 6-5. Alarm Test — Model 305 Simulator Settings

SECTION	SWITCH	SETTING
FECG/MECG/ABD(FECG)	Main	RATE
	Rate	MANUAL
	Mode	MECG
	QRS Amplitude	15 µV
	QRS Polarity	+
MISCELLANEOUS	Pattern Memory	OFF

14. Using the simulator's **Manual Adjustment** knob, input an MECG signal of 119 bpm as indicated on the monitor. Verify that there is no alarm tone sounding from the monitor's rear panel speaker.

15. Using the simulator's **Manual Adjustment** knob, increase the MECG rate to 120 bpm. Again, verify that there is no alarm tone sounding from the rear panel speaker.

16. Using the simulator's **Manual Adjustment** knob, increase the MECG rate to 121 bpm. Verify the following on the monitor:

    - The following alarm tone is emitted from the rear panel speaker: alternating high/low tones for four seconds, and silence for seven seconds. The sequence continues until the alarm condition is removed (following steps.)
    - The Maternal Pulse Value is flashing.

17. Depress the monitor's front panel **Alarm Cancel** pushbutton and verify the following:

    - The alarm tone is silenced.
    - The Maternal Pulse Value is no longer flashing.

18. Wait 30 seconds and verify the following:

    - The alarm tone is once again emitted from the rear panel speaker.
    - The Maternal Pulse Value is flashing again.

19. Depress the monitor's front panel **Alarm Cancel** pushbutton again.

20. Use the simulator's **Manual Adjustment** knob to decrease the MECG signal to 120 bpm. Verify the following on the monitor:

    - The alarm tone is silenced.
    - The Maternal Pulse Value is no longer flashing.
    - After 10 seconds, the two above conditions are still true.

21. Using the simulator's **Manual Adjustment** knob, input an MECG signal of 61 bpm. Verify that there is no alarm tone sounding from the rear panel speaker.

22. Using the simulator's **Manual Adjustment** knob, decrease the MECG rate to 60 bpm. Again, verify that there is no alarm tone sounding from the rear panel speaker.

23. Using the simulator's **Manual Adjustment** knob, decrease the MECG rate to 59 bpm. Verify the following on the monitor:

    - The alarm tone is emitted from the monitor's rear panel speaker.
    - The Maternal Pulse Value is flashing.

24. Depress the monitor's front panel **Alarm Cancel** pushbutton and verify the following:

    - The alarm tone is silenced.
    - The Maternal Pulse Value is no longer flashing.

25. Wait ten seconds and verify the following:

    - The alarm tone is once again emitted from the rear panel speaker.
    - The Maternal Pulse Value is flashing again.

26. Depress the monitor's front panel **Alarm Cancel** pushbutton again.

27. Use the simulator's **Manual Adjustment** knob to decrease the MECG signal to 60 bpm. Verify the following on the monitor:

    - The alarm tone is silenced.
    - The Maternal Pulse Value is no longer flashing.
    - After 10 seconds, the two above conditions are still true.

CALIBRATION

This section of the manual provides a calibration procedure which allows authorized service personnel to perform an instrument alignment using a minimum of test equipment. This procedure is not intended to replace a complete instrument checkout and alignment as performed at the Corometrics factory. It should be considered a performance check and troubleshooting guide to be used in conjunction with other information supplied throughout this service manual. It is important to mention, this section of the manual is not intended as a substitute for proper professional training, or familiarity with the Model 118. Only qualified service personnel should attempt servicing the Model 118.

INITIAL CONDITIONS

Read each instruction carefully and thoroughly before executing the procedural step.

1. Ensure the Power switch on the front panel is not depressed.

2. Connect the Model 118 Maternal/Fetal Monitor's power cord to the J101 power receptacle on the unit's rear panel. Next, plug the other end of the power cord into a properly grounded AC outlet.

3. Apply power to the Model 118 Maternal/Fetal Monitor by depressing the Power switch on the unit's front panel. Next, verify the following:

   - The green LED indicator located above the Power pushbutton illuminates.
   - Three power-up tones are sounded.

CALIBRATION PROCEDURES

Refer to the associated assembly drawings in Section 14 for the location of adjustments and test points referred to in the calibration procedures. The board assembly drawing numbers are given for each board in this section. The electronic calibration procedure outlined in this Section necessitates removal of the Model 118 Maternal/Fetal Monitor's top cover. Also, the following equipment will be needed in order to carry out the procedural steps.

- Digital Voltmeter, Fluke 8020A or equivalent
- Plastic Alignment Tool
- Oscilloscope

Power Supply Board (No. 8370) Printhead Voltage Adjustment

When facing the Model 118 from the front, the Power Supply Board is located on the extreme right side of the unit. Connector J306 is located on the upper edge of the board to the right of center. The pin numbers are marked on the Power Supply Board adjacent to the J306 connector.

1. Connect the positive lead of the voltmeter to J306, pin 9. Connect the negative lead to J306, pin 6.

2. Adjust R1 on the Power Supply Board for +5.04 Vdc ± 10 mV. (R1 is located on the upper left edge of the board.)

3. Connect the positive lead of the voltmeter to J306, pin 7. Connect the negative lead to J306, pin 12.

4. Adjust R72 for +30.35 Vdc ± 50 mV. (R72 is located in the middle of the board to the left of center.)

5. Turn on the recorder by depressing the front panel **Record** pushbutton.

6. Connect the positive lead of the voltmeter to J306, pin 2. Connect the negative lead of J306, pin 6.

7. Adjust R73 for +7.02 Vdc ± 10 mV. (R73 is located in the middle of the board to the right of center.)

8. Depress and hold the Model 118's **Paper Advance** pushbutton and verify a voltage reading of +20.40 Vdc ± 200 mV at J306, pin 2.

   NOTE: There is no adjustment for this voltage.

9. Connect the positive lead of the voltmeter to J306, pin 8. (The negative lead should still be connected to J306, pin 6.)

10 Adjust R63 for the VHEAD voltage stamped on the Recorder Assembly Printhead. The VHEAD voltage should be set within ±100 mv of the indicated VHEAD voltage.

Multifunction Board (No. 7931) Adjustments

When facing the card cage from the front of the unit, the Multifunction Board is the second board in from the left side. Adjust the excitation voltage for the pressure transducers by adjusting R72 for +4 Vdc ± 2 mV at TP22. Use TP34 as reference ground.

Peripheral Board (No. 10621) Adjustments

When facing the card cage from the front of the unit, the Peripheral Board is the third board in from the left side. Calibrating the Peripheral Board DACs requires using two of the Model 118's internal service diagnostic tests. Internal service diagnostic Tests #3 and #4 are used to verify and calibrate the three digital to analog converters (DACs) on the Peripheral Board (No. 10621). Each DAC output is available at test points on the Peripheral Board as well as the rear panel connector J102. The output signals represent the HR #1, HR #2, and UA analog values.

Corometrics vs. Hewlett Packard Central Station Outputs. The Peripheral Board (No. 10621) incorporates jumpers to allow adjusting the central station outputs HR1, HR2, and UA to standard Corometrics Central Systems or for Hewlett Packard Central Systems. Refer to the assembly drawings for the positions of these jumpers. JMP1 and JMP2 must bridge pins 2 and 3 for Corometrics output levels, or bridge pins 1 and 2 for Hewlett Packard output levels. Whenever the jumpers are moved, calibration of the outputs must be checked and readjusted as necessary.

Accessing the Internal Service Diagnostic Tests. To access the internal service diagnostic tests:

1. Disconnect all transducers and peripheral equipment from the Model 118.

2. Power up the Model 118 while depressing and holding the **Test** pushbutton. Service Screen #1 is displayed (Heart Rate Offset / Volume Configuration).

   NOTE: If Service Screen #1 does not appear, refer to *Section 5, Setup Procedures* for information about enabling the Service Mode screens.

3. Press the **Setup** pushbutton twice to display Service Screen #3 (Internal Tests).

4. Perform the procedure(s) listed under *Using Test #3, DAC Static Test* and/or *Using Test #4, DAC Ramp Test.*

5. Press **Record** or **Test** to exit the Service Mode.

Using Test #3, DAC Static Test.

This test is used to verify and calibrate the Peripheral Board DACs.

1. While Service Screen #3 is displayed, use the △▽ keys to display Test Number 3, DAC Static Test, shown in Figure 7-1.

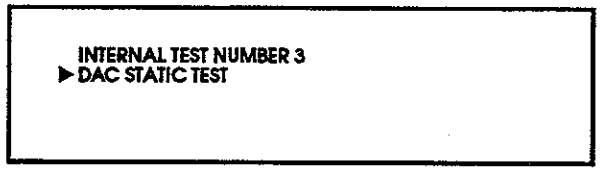

Figure 7-1. Internal Test Number 3

2. Press **Select** to advance to the next step of the test. The cursor points to the default value of 0 V.

3. Use the △ ▽ keys to cycle through the available DAC output settings: 0 V, –1.2 V, and +1.2 V. (These are the actual DAC outputs for Corometrics Central Stations. Although the display settings do not change for adjusting outputs for a Hewlett Packard Central Station, the actual output voltages differ.)

4. Press the **Select** pushbutton to activate the test. The screen will display . . .**WORKING.** Tables 7-1 and 7-2 list the DAC output voltage test points located on the Peripheral Board, the associated J102 pin numbers, the measured voltage allowable values, and the adjustment potentiometers. (Refer to Table 7-1 for Corometrics Central Station Outputs; refer to Table 7-2 for Hewlett Packard Central Station Outputs.) If the measured voltage value does not fall within the given range, adjust accordingly. When measuring voltages on J102, pin 3 may be used as a ground.

5. Press **Setup** to stop the test and continue on to another internal service diagnostic test, such as Test #4 described next; *or* press **Select** to stop the test and choose a different voltage level to test by repeating steps 3 and 4 above. Repeat the process as many times as needed to calibrate the outputs.

Table 7-1. Internal Test #3, DAC Output Voltages and Adjustment Points for Corometrics Central Station Outputs

ANALOG SIGNAL	MEASUREMENT SITE	DAC OUTPUT	EXPECTED VOLTAGE	ADJUSTMENT SITE
HR1	TP5 or J102, pin 7	0 V	0 V ± 10 mV	—
		–1.2 V	–1.2 V ± 10 mV	R83
		+1.2 V	+1.2 V ± 10 mV	R81
HR2	TP6 or J102, pin 22	0 V	0 V ± 10 mV	—
		–1.2 V	–1.2 V ± 10 mV	R111
		+1.2 V	+1.2 V ± 10 mV	R113
UA	TP4 or J102, pin 2	0 V	0 V ± 24 mV	—
		–1.2 V	–1.2 V ± 24 mV	R69
		+1.2 V	+1.2 V ± 24 mV	R67

Table 7-2. Internal Test #3, DAC Output Voltages and Adjustment Points for Hewlett Packard Central Station Outputs

ANALOG SIGNAL	MEASUREMENT SITE	DISPLAY DAC SETTING	ACTUAL DAC OUTPUT	EXPECTED VOLTAGE	ADJUSTMENT SITE
HR1	TP5 or J102, pin 7	0 V	+1.2 V	+1.2 V ± 10 mV	—
		–1.2 V	0 V	0 V ± 10 mV	—
		+1.2 V	+2.4 V	+2.4 V ± 10 mV	R81
HR2	TP6 or J102, pin 22	0 V	+1.2 V	+1.2 V ± 10 mV	—
		–1.2 V	0 V	0 V ± 10 mV	—
		+1.2 V	+2.4 V	+2.4 V ± 10 mV	R113
UA	TP4 or J102, pin 2	0 V	+5 V	+5 V ± 24 mV	—
		–1.2 V	0 V	0 V ± 24 mV	—
		+1.2 V	+10 V	+10 V ± 24 mV	R67

Using Test #4, DAC Ramp Test. An easy way to verify DAC calibration is provided by Test Number 4. This test programs the Peripheral Board DACs for a ramped output voltage. If the Peripheral Board is configured for Corometrics Central Station outputs, the ramp begins at +1.2 V and ends at –1.2 V. If the Peripheral Board is configured for Hewlett Packard Central Station outputs: for HR1 and HR2, the ramp begins at +2.4 V and ends at 0 V; for UA, the ramp begins at +10 V and ends at 0 V. In all cases the ramp is continuous and has a period of approximately 250 ms. After completing Test Number 3:

1. While Service Screen #3 is displayed, use the △ ▽ keys to display Test Number 4, DAC Ramp Test, shown in Figure 7-2.

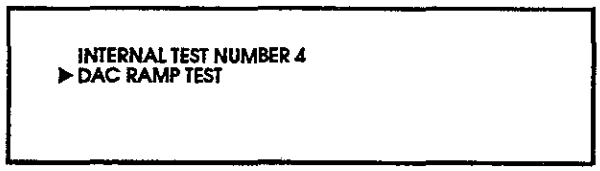

Figure 7-2. Internal Test Number 4

2. Press **Select** to activate the test. The screen will display . . . **WORKING**. Measure the voltages using the test points or associated J102 pin numbers listed in Table 7-3.

3. Press either **Setup** or **Select** to stop the test.

Table 7-3. Internal Test #4, DAC Ramp Test Measurement Sites.

ANALOG SIGNAL	MEASUREMENT SITE	COROMETRICS CENTRAL STATION OUTPUTS	HEWLETT PACKARD CENTRAL STATION OUTPUTS	
		EXPECTED VOLTAGE (HR1, HR2, UA)	EXPECTED VOLTAGE (HR1, HR2)	EXPECTED VOLTAGE (UA)
HR1	TP5 or J102, pin 7	Continuous ramp starting at +1.2 V and ending at –1.2 V with a period of 250 ms.	Continuous ramp starting at +2.4 V and ending at 0 V with a period of 250 ms.	Continuous ramp starting at +10 V and ending at 0 V with a period of 250 ms.
HR2	TP6 or J102, pin 22			
UA	TP4 or J102, pin 2			

Peripheral Board Paper Out Adjustment

1. Place paper in the strip chart recorder's paper tray with the black dots in backwards. The black dots will be running out of the recorder on the left hand side of the recorder.

2. Connect the voltmeter's positive lead to TP13 on the Peripheral Board. Connect the negative lead to TP11.

3. For the correct "white paper" voltage, less than 2.6 Vdc should be measured on TP13. If the level is higher than 2.6 Vdc, adjust R49 on the Peripheral Board to reduce the level. Remove the paper, and close the recorder door. The voltage on TP13 should be greater than 4.5 Vdc. If the level is incorrect, adjust R49 to increase the level.

4. Repeat this procedure until the voltages measured on TP13 fall within specified ranges without adjusting R49.

Peripheral Board Paper Low Adjustment

1. Place paper in the strip chart recorder's paper tray with the black dots in the recorder drawer correctly. The dots will be on the right hand side of the recorder.

2. Connect the voltmeter's positive lead to TP12 on the Peripheral Board. Connect the negative lead to TP11.

3. For the correct "black dots" voltage, more than 4.5 Vdc should be measured on TP12. If the level is lower than 4.5 Vdc, adjust R47 on the Peripheral Board to increase the level. For the correct "white paper" voltage, less than 2.6 Vdc should be measured on TP12. If the level is higher than 2.6 Vdc, adjust R47 on the Peripheral Board to reduce the level.

4. Repeat this procedure until the voltages measured on TP12 fall within specified ranges without adjusting R47.

Display Power Supply Board

As stated other places in this manual, the Display Board and corresponding Display Power Supply Board are manufactured by Planar Systems, Inc. These boards are calibrated in unison at the Planar factory. Due to calibration voltage adjustments, if replacement of either board is necessary, they must be replaced together as a matched pair.

⚠ **IMPORTANT:** Do not adjust R19 or R20. R19 is a power supply switcher frequency adjustment that optimizes power supply efficiency. It is a one-time adjustment to provide for component differences on the Display Power Supply Board. R20 is a factory voltage calibration which optimizes overall display performance.

In troubleshooting, the following methods can be employed to determine whether a problem exists on the Display Board and Display Power Supply Board or the Model 118 Peripheral Board (No. 10621).

1. Using a digital voltmeter, attach the positive lead to J3, pin 1. Attach the negative lead to J3, pin 7. Verify a reading of +12 V ± 1.2 V.

2. Attach the positive lead to J3, pin 3. Verify a reading of +5 V ± .25 V. (Steps 1 and 2 verify that the Peripheral Board is supplying the correct voltages to the Display Power Supply Board.)

3. Using an oscilloscope, attach the positive lead to J3, pin 11 (HS). Attach the negative lead to J3, pin 7. Verify the output of a periodic waveform. Repeat for J3, pin 9 (VS) and J3, pin 13 (VCLK).

4. Attach the positive lead to J3, pin 15 (VID) and verify the presence of a video data signal.

5. If you suspect that the Peripheral Board is not supplying the correct voltage or one of the video signals is missing and you have another properly functioning Model 118, substitute the Peripheral Board and check for proper operation.

6. If you suspect that the Display Board or Display Power Supply Board are not functioning properly, and you have another Model 118 that is functioning properly, substitute the pair of Display Boards and check for proper operation.

LARGE BUTTON TOCOTRANSDUCER CALIBRATION

To maintain UA reference compatibility with the Model 115 Fetal Monitor, the large button tocotransducer for the Model 118 must be calibrated using the following procedure.

Equipment Required:

- DVM: DM501 or equivalent with x1 probe or leads
- Corometrics CMR Test Jack (Refer to Figure 7-3 and Table 7-4)
- Calibrated 118 Maternal/Fetal Monitor
- Screwdriver or potentiometer adjustment tool
- 52.5 gram weight (Corometrics Cat. #7825AA)
- Sealing tape (Corometrics Cat. # 7730AA)
- Torque Seal

Procedure:

1. Remove the name plate and sealing tape from the top cover of the tocotransducer.
2. Set the ZERO TRIM and GAIN potentiometers (refer to Figure 7-4) in the tocotransducer fully counter clockwise.
3. Connect the DVM to TP19 on the Multifunction Board (No. 7931).
4. Apply power to the Model 118 and plug the CMR jack into the front panel **UA** connector.
5. Measure the voltage at TP19 and record the value.
6. Replace the CMR jack with the tocotransducer to be calibrated.
7. Invert the tocotransducer so that the button is up and center the 52.5 gram weight on the button.
8. Adjust the ZERO TRIM potentiometer in the tocotransducer to match the reading recorded in step 5, ± .005 V. Record the value.

   NOTE: If the ZERO TRIM pot is not enough, center the ZERO TRIM pot and adjust the ZERO CENTER pot (refer to Figure 7-4) to match the reading recorded in step 5, ± 1.0 V. Then use the ZERO TRIM to match step 5, ± .005 mV.
9. Remove the 52.5 gram weight and adjust the GAIN pot in the tocotransducer for a reading 786 mV greater than the reading in step 8, ± .005 mV.
10. Place the 52.5 gram weight on the tocotransducer. Verify TP19 matches the reading recorded in step 8, ± 5 mV.
11. Repeat steps 8 through 10 as required until TP19 falls into specification with and without the 52.5 gram weight applied.
12. Torque seal all pots. Reseal with waterproof sealing tape and reinstall the name plate.

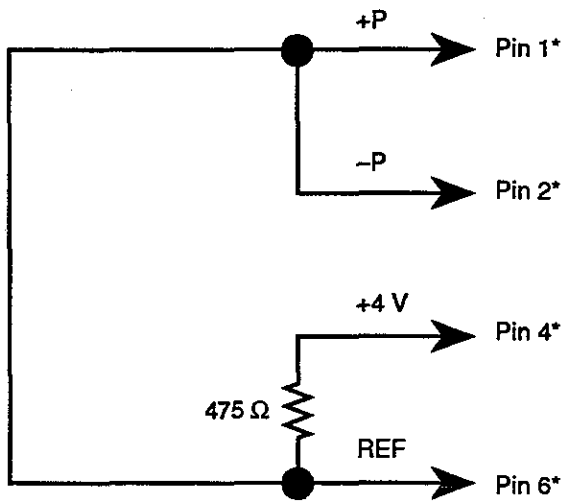

Figure 7-3. CMR Test Jack

Table 7-4. CMR Test Jack Components

PART DESCRIPTION	COROMETRICS CATALOG #
Pressure Connector	6158J
475 Ω, 1/8 W , 1 % Resistor	472127

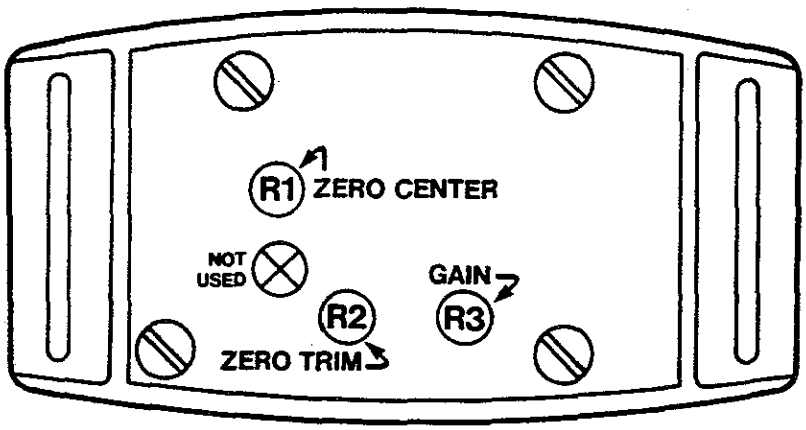

Figure 7-4. Large Button Tocotransducer

POWER SWITCH ACTUATOR CABLE ADJUSTMENT

If repair or replacement of the Power Switch or cable is required, the following adjustments must be made:

1. Remove the Model 118 top cover and verify that the center wire of the cable protrudes .060 ± .060 inches beyond the power switch brass block (reference Cabinet Enclosure Assembly Drawing, No. 10804TAB). If the cable does not meet this specification, use a 1/16" Allen wrench to loosen the set screw; adjust the cable; then re-tighten the set screw.

2. Loosen the Model 118 front bezel enough to verify that the power switch button protrudes .125 ± .015 inches beyond the front surface of the bezel (reference Final Assembly Drawing, No. 10770TAB). If the button protrudes beyond this specification, turn the button in the clockwise direction one full turn at a time until a proper measurement is obtained. If the button is recessed below this specification, turn the button in the counterclockwise direction one full turn at a time until a proper measurement is obtained.

   NOTE: Do not bend or kink the cable.

3. Check for proper operation.

4. Replace front bezel and top cover.

DIAGNOSTIC SELF-TESTS

This section of the manual provides information which will help the biomedical engineer isolate Model 118 Maternal/Fetal Monitor failures to the board or component level. The Model 118 incorporates a number of software based self-test diagnostic features designed to enhance verification of the unit's internal circuitry. It is important to mention, this section of the manual is not intended as a substitute for proper professional training, or familiarity with the Model 118. Only qualified service personnel should attempt servicing the Model 118.

The Model 118 self-test diagnostics are either automatically run or manually accessed through four operating modes:

- Power-On Diagnostic Tests
- Test Pushbutton Diagnostic Tests
- Internal Service Diagnostic Tests
- Operating Diagnostic Tests

POWER-ON DIAGNOSTIC TESTS

Applying power to the Model 118 causes the power-on diagnostic tests to run automatically. Upon power-up, the DSP Board performs a number of tests before allowing the Model 118 to enter the normal operational mode. After depressing the power pushbutton, the test will run for approximately two seconds. After the two seconds has elapsed, the Model 118 enters the normal operational mode. Refer to Table 8-1 for the diagnostics performed during the two second test period.

Power-On Diagnostics, All Tests Pass

If the power-on tests pass, the DSP board LEDs will display the information shown in Table 8-2. The Model 118 will be in the normal run mode at this time.

Power-On Diagnostics, Test Failures

If the power-on tests fail, the DSP board has the ability to display one of the error codes shown in Table 8-3 (on LEDs DS1–DS4). However, when a failure occurs, the CPU Board will continuously attempt to reset the DSP Board. In this condition, the displayed error code on the DSP Board's LEDs is rapidly reset, not allowing enough time to read the error code. Removing the CPU Board allows the DSP Board to run without being reset. In this condition, the DSP Board will display one of the error codes shown in Table 8-3. Table 8-3 also gives a possible cause of the failure. If the DSP board itself fails, the Model 118 front panel display will list an error message in the upper lefthand corner; the remainder of the display will be blank. These major malfunction error messages are listed in Table 8-12.

Table 8-1. Power-On Diagnostics

DSP BOARD LEDS	LED CONDITION
DS2	Blinks at .5 Hz rate to indicate a run condition.
DS1	Turns on and off every millisecond. The LED actually appears on, but dim.
DS4	Blinks once for every HR #1 event.
DS3	Blinks once for every HR #2 event.

NOTE: If the monitor fails the CRC test, contact your Corometrics Service Representative; do not use this monitor on patients until the problem is resolved.

3. Depress **Setup** or **Select** to stop the test. **TEST STOPPED** is displayed at the bottom of the screen.

Test #2, Eighth Dot Test. Test #2 prints a dot pattern comprised of every eighth dot on the strip chart recorder paper. Eight different dot patterns are available.

1. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 2, shown in Figure 8-2.

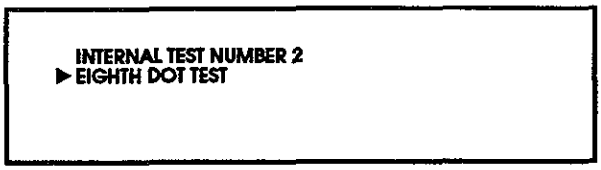

Figure 8-2. Eighth Dot Test, Level 1

2. Depress **Select** to display the second level of the test, shown in Figure 8-3.

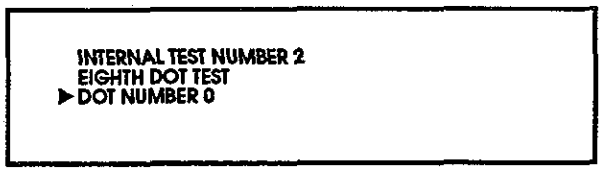

Figure 8-3. Eighth Dot Test, Level 2

3. Use the △ ▽ pushbuttons to select a dot pattern (0-7).

4. Depress **Select** to activate the test. **WORKING . . .** is displayed at the bottom of the screen and the recorder begins to print the selected dot pattern. The test will run continuously until you stop it in step 5.

   NOTE: If no paper is installed in the recorder, the test will not activate. Also, if paper runs out during the test, the test will automatically stop.

5. To stop the test and go on to another internal test, depress **Setup.** To stop the test and select a different dot pattern, depress **Select**; then repeat from step 3.

Test #3, DAC Static Test. Test #3 is used to verify and calibrate the three digital to analog converters (DACs) on the Peripheral Board (No. 10621). Each DAC output is available at test points on the Peripheral Board as well as the rear panel connector J102. The output signals represent the HR1, HR2, and UA analog values. Since this test involves calibration of the Peripheral Board, the procedure is detailed in *Section 6, Calibration* .

Test #4, DAC Ramp Test. Test #4 programs the Peripheral Board DACs (same as Test #3 DACs) for a ramped output voltage beginning at +1.2 V, and ending at –1.2 V. The ramp is continuous and has a period of approximately 250 ms. Since this test involves calibration of the Peripheral Board, the procedure is detailed in *Section 6, Calibration.*

Test #5, Absolute UA Test. Test #5 programs the monitor to display the value of the UA input as an absolute number.

1. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 5, shown in Figure 8-4.

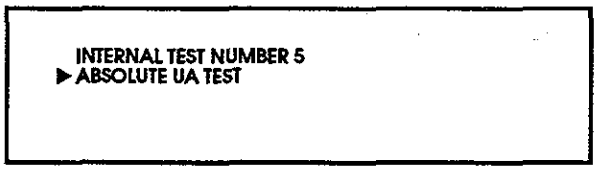

Figure 8-4. Absolute UA Test Screen

2. Connect a tocotransducer or IUP monitoring device to the **UA** connector on the front panel of the monitor.

3. Depress the **Select** pushbutton to activate the test. When the test is complete, the display should display the absolute value within the ranges listed in Table 8-5. An example of the screen in shown in Figure 8-5.

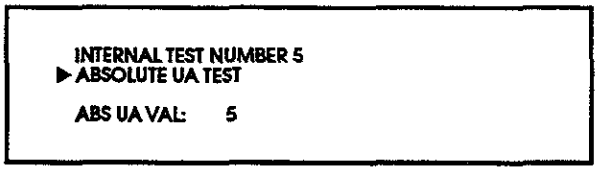

Figure 8-5. Absolute UA Test Results Example

Table 8-5. Absolute UA Test Ranges

UA MODE	ABSOLUTE PRESSURE VALUE
Tocotransducer (without applied pressure)	–20 ± 10 relative units
IUP	0 ± 10 mmHg

Table 8-6. DAC Mode Output Values

TEST SEQUENCE NUMBER	MODE			VOLTAGE		
	HR1 (TP1)	HR2 (TP2)	HR3 (TP3)	TP1 or J102, pin 17	TP2 or J102, pin 1	TP3 or J102, pin 24
1	FECG	US	TOCO	–5 ± 0.2 V	5 ± 0.2 V	10 ± 0.2 V
2	US	MECG	IUP	5 ± 0.2 V	10 ± 0.2 V	5 ± 0.2 V
3	INOP	US2	INOP	10 ± 0.2 V	5 ± 0.2 V	–5 ± 0.2 V
4	US	INOP	TOCO	5 ± 0.2 V	0.0 V	10 ± 0.2 V

Test #6, Mode DAC Test. Test #6 programs two Peripheral Board DACs for specific output voltages expected on the HR1, HR2 and UA mode output lines. The output voltages can be measured on the Peripheral Board test points or the J102 pin numbers.

1. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 6, shown in Figure 8-6.

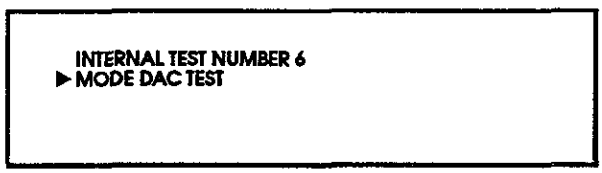

Figure 8-6. Mode DAC Test Screen, Level 1

2. Press **Select** to display the second level of the test, shown in Figure 8-7.

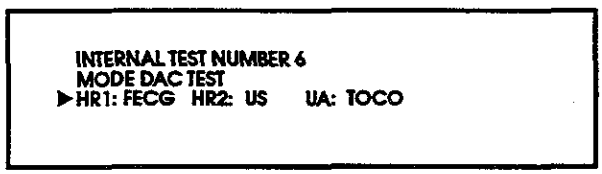

Figure 8-7. Mode DAC Test Screen, Level 2

3. Use the △▽ pushbuttons to select one of four test sequences, listed in Table 8-6.

4. Depress **Select** to activate the test. **WORKING . . .** is displayed at the bottom of the screen; the expected voltages for each mode are listed in Table 8-6. The test will run continuously until you stop it in step 5.

5. To stop the test and go on to another internal test, depress **Setup.** To stop the test and select a different mode test sequence, depress **Select**; then repeat from step 3.

Test #7, Switch Display Test. Test #7 displays hexadecimal values representing the settings of Peripheral Board (No. 10621) hardware switches SW1 and SW2. Switch number 1 is represented as the most significant bit; switch number 8 is the least significant bit.

NOTE: SW1-7 and SW1-8 are not wired.

1. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 7 shown in Figure 8-8.

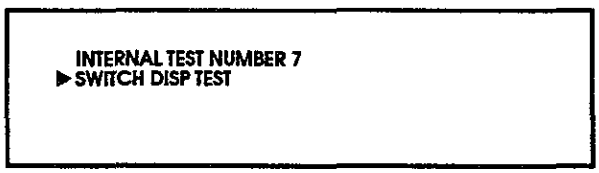

Figure 8-8. Switch Display Test Screen

2. Press **Select** to activate the test. The hexadecimal values for each switch are displayed at the bottom of the screen, as shown in Figure 8-9. The hexadecimal values for SW1 are summarized in Table 8-7; the hexadecimal values for SW2 are summarized in Tables 8-8. If you do not want to complete the test, continue on to step 3.

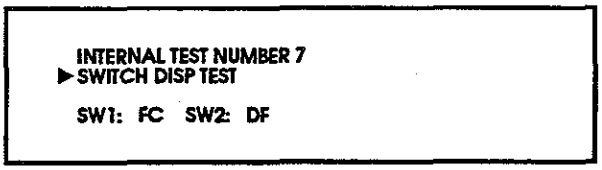

Figure 8-9. Switch Display Test Results Example*

3. Press **Setup** or **Select** to terminate the test. **TEST STOPPED** is displayed at the bottom of the screen.

Test #8, RS-232C Loopback Test. Test #8 is the RS-232C loopback test for the communication ports available at J109 and J110. The communication port control signals are sourced from the Peripheral Board (No. 10621). Running the test requires inserting a loopback test connector into J109 and J110. Fabricating the test connectors requires two male, 9-pin D-shell connectors with the following pins jumpered:

- On each connector, bridge pins 2 and 3 together.
- On each connector, bridge pins 7 and 8 together.
- On each connector, bridge pins 4 and 6 together.

1. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 8, shown in Figure 8-10.

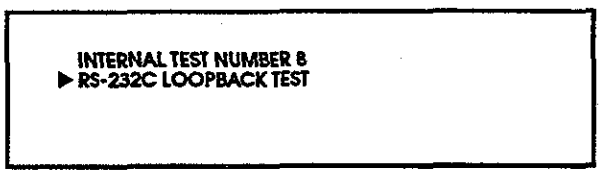

Figure 8-10. RS-232C Loopback Test Screen

2. Insert the test connectors in J109 and J110.

3. Press **Select** to activate the test. **WORKING . . .** is displayed at the bottom of the screen. When the test is complete, each connector will display either **TEST PASSED** or **TEST FAILED**, as shown in Figure 8-11. If you do not wish to complete the test, continue on to step 4.

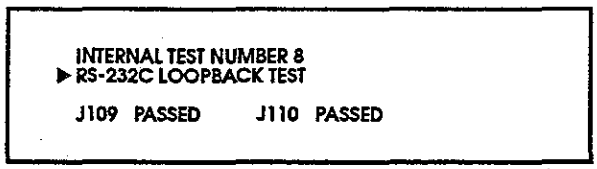

Figure 8-11. RS-232C Loopback Test Results Example

NOTE: If a communication port fails the self-test, contact your Corometrics Service Department. Do not use this port to connect to any peripheral equipment until the equipment has been serviced.

4. Press **Setup** or **Select** to terminate the test. **TEST STOPPED** is displayed at the bottom of the screen.

Test #9, Strobe Width Test. Test #9 is a special test used by the Corometrics Factory to verify strip chart recorder print head elements. Also, the test provides a method of verifying the operation of the strobe width safety timer circuit on the Peripheral Board (No. 10621). The test is not intended for use when performing standard Model 118 repair or maintenance. In the event a service representative wants to verify the safety timer circuit output, the following procedure is used:

1. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 9, shown in Figure 8-12.

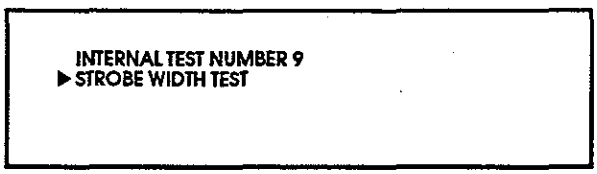

Figure 8-12. Strobe Width Test Screen

2. Depress **Select** to activate the test; **WORKING . . .** is displayed at the bottom of the screen. Activation of the test causes the Model 118 to output a 10 ms strobe signal to the printhead. When the strobe width safety timer circuit is working properly, only a 6.5 ms strobe should be seen at the printhead. An oscilloscope is required to verify the strobe signal timing. The test will run continuously until you stop it in step 5.

---

* *Although the screen on the monitor lists SW3 and SW4, the values at this time represent SW1 and SW2 on the Peripheral Board.*

3. Connect channel #1 of an oscilloscope to the Peripheral Board's U64, pin 13. Trigger on the falling edge (low going) of this signal. U64, pin 13 goes low for 10 ms.

4. Using channel #2 of the oscilloscope, verify a high going 6.5 ms pulse on U64, pin 2 and U64, pin 12.

5. Press **Setup** or **Select** to stop the test. **TEST STOPPED** is displayed at the bottom of the screen.

Test #10, Error Log. Test #10 prints a service log of the Model 118 on the strip chart recorder paper. The service log is helpful when diagnosing intermittent problems, or if the service representative requires basic information such as software versions installed in a unit. The service log lists the following information:

- Date and Time
- Main CPU Software Version
- DSP Board CPU Software Version
- Model 118 Monitor Use, Total Time
- Strip Chart Recorder Use, Total Time
- Model 118 Error Log

1. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 10, shown in Figure 8-13.

Figure 8-13. Error Log Screen

2. Press **Select** to activate the test. **WORKING . . .** is displayed at the bottom of the screen and the strip chart recorder begins to print the service log information. Table 8-9 describes all the possible Model 118 error log codes resultant from the Test #10 service log printout. Errors appear as **Exx nnn qq qq** where **xx** is the error code; **nnn** is the number of times this error occurred, and **qq** is a qualifier from the table. The qualifiers add more information about the first and last times the error occurred. When the printout is complete, **TEST COMPLETE** appears at the bottom of the screen. If you do not wish to complete the test, continue on to step 3.

   NOTE: If no paper is installed in the recorder, the test will not activate. Also, if paper runs out during the test, the test will automatically stop.

3. Press **Setup** or **Select** to terminate the test.

Test #11, Clear Error Log. Test #11 clears the Model 118 Error Log printed in Test #10. Running Test #11 clears only the error log and does not clear the total time values stored in battery backed RAM.

1. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 11, shown in Figure 8-14.

Figure 8-14. Clear Error Log Screen

2. Press **Select** to activate the test. **WORKING . . .** is displayed at the bottom of thee screen; the front panel record LED illuminates for approximately two seconds. **TEST COMPLETE** appears at the bottom of the screen when the error log has been cleared. If you do not wish to complete the test, continue on to step 3.

3. Depress **Setup** or **Select** to terminate the test. **TEST STOPPED** is displayed at the bottom of the screen.

Table 8-7. SW1 Hexadecimal Values

SW1			
HEXADECIMAL NUMBER	LANGUAGE SELECTION	HR PAPER SCALE (bpm)	SERVICE MODE SCREENS
00	Future use	50–210	Locked
04	Future use	50–210	Locked
08	Italian	50–210	Locked
0C	Japanese	50–210	Locked
10	German	50–210	Locked
14	French	50–210	Locked
18	Spanish	50–210	Locked
1C	English	50–210	Locked
20	Future use	30–240	Locked
24	Future use	30–240	Locked
28	Italian	30–240	Locked
2C	Japanese	30–240	Locked
30	German	30–240	Locked
34	French	30–240	Locked
38	Spanish	30–240	Locked
3C	English	30–240	Locked
40	Future use	50–210	Unlocked
44	Future use	50–210	Unlocked
48	Italian	50–210	Unlocked
4C	Japanese	50–210	Unlocked
50	German	50–210	Unlocked
54	French	50–210	Unlocked
58	Spanish	50–210	Unlocked
5C	English	50–210	Unlocked
60	Future use	30–240	Unlocked
64	Future use	30–240	Unlocked
68	Italian	30–240	Unlocked
6C	Japanese	30–240	Unlocked
70	German	30–240	Unlocked
74	French	30–240	Unlocked
78	Spanish	30–240	Unlocked
7C	English	30–240	Unlocked

Table 8-7 — *continued*

SW1			
HEXADECIMAL NUMBER	**LANGUAGE SELECTION**	**HR PAPER SCALE (bpm)**	**SERVICE MODE SCREENS**
80	Future use	50–210	Locked
84	Future use	50–210	Locked
88	Italian	50–210	Locked
8C	Japanese	50–210	Locked
90	German	50–210	Locked
94	French	50–210	Locked
98	Spanish	50–210	Locked
9C	English	50–210	Locked
A0	Future use	30–240	Locked
A4	Future use	30–240	Locked
A8	Italian	30–240	Locked
AC	Japanese	30–240	Locked
B0	German	30–240	Locked
B4	French	30–240	Locked
B8	Spanish	30–240	Locked
BC	English	30–240	Locked
C0	Future use	50–210	Unlocked
C4	Future use	50–210	Unlocked
C8	Italian	50–210	Unlocked
CC	Japanese	50–210	Unlocked
D0	German	50–210	Unlocked
D4	French	50–210	Unlocked
D8	Spanish	50–210	Unlocked
DC	English	50–210	Unlocked
E0	Future use	30–240	Unlocked
E4	Future use	30–240	Unlocked
E8	Italian	30–240	Unlocked
EC	Japanese	30–240	Unlocked
F0	German	30–240	Unlocked
F4	French	30–240	Unlocked
F8	Spanish	30–240	Unlocked
FC	English	30–240	Unlocked

Table 8-8. SW2 Hexadecimal Values

SW2				
HEXADECIMAL NUMBER	**SERVICE SCREEN #5**	**BP UNITS**	**UA UNITS**	**BP MODULE**
0A	Enabled	kPa	kPa	Enabled
0X*	Disabled	kPa	kPa	Enabled
1A	Enabled	kPa	kPa	Enabled
1X*	Disabled	kPa	kPa	Enabled
2A	Enabled	kPa	kPa	Disabled
2X*	Disabled	kPa	kPa	Disabled
3A	Enabled	kPa	kPa	Disabled
3X*	Disabled	kPa	kPa	Disabled
4A	Enabled	kPa	mmHg	Enabled
4X*	Disabled	kPa	mmHg	Enabled
5A	Enabled	kPa	mmHg	Enabled
5X*	Disabled	kPa	mmHg	Enabled
6A	Enabled	kPa	mmHg	Disabled
6X*	Disabled	kPa	mmHg	Disabled
7A	Enabled	kPa	mmHg	Disabled
7X*	Disabled	kPa	mmHg	Disabled

** X = any value other than A.*

Table 8-8 — *continued*

SW2				
HEXADECIMAL NUMBER	**SERVICE SCREEN #5**	**BP UNITS**	**UA UNITS**	**BP MODULE**
8A	Enabled	mmHg	kPa	Enabled
8X*	Disabled	mmHg	kPa	Enabled
9A	Enabled	mmHg	kPa	Enabled
9X*	Disabled	mmHg	kPa	Enabled
AA	Enabled	mmHg	kPa	Disabled
AX*	Disabled	mmHg	kPa	Disabled
BA	Enabled	mmHg	kPa	Disabled
BX*	Disabled	mmHg	kPa	Disabled
CA	Enabled	mmHg	mmHg	Enabled
CX*	Disabled	mmHg	mmHg	Enabled
DA	Enabled	mmHg	mmHg	Enabled
DX*	Disabled	mmHg	mmHg	Enabled
EA	Enabled	mmHg	mmHg	Disabled
EX*	Disabled	mmHg	mmHg	Disabled
FA	Enabled	mmHg	mmHg	Disabled
FX*	Disabled	mmHg	mmHg	Disabled

* *X = any value other than A.*

Table 8-9. Service Log Error Codes

CODE	DESCRIPTION	QUALIFIER
E01	Mail Box Full	Task (Refer to Table 7-10.)
E02	No Room	0 or 1st Character
E03	Battery Ram Failed	0
E04	Keypad Link Error	Character
E05	Keypad Message Error	Character
E06	Keypad Parity Error	0
E07	Kaypad Time Error	0
E08	Spare	—
E09	Spare	—
E10	System RAM Error	0
E11	Shared Memory Error, CPU/DSP	0
E12	DSP Error	1 = CRC Error 2 = A/D Failure 3 = Correlator Program Error 4 = Power-Up RAM Failure 5 = Health Check Failure 6 = Health Program RAM Failure 7 = Health Data RAM Failure 8 = Cycle Time Missed 9 = Supply Voltage Error
E13	DSP Error 2	Unused
E14	DSP Timeout Error	0
E15	COROLAN Not Ready	8530 Read Register 0
E16	COROLAN Buffer Overflow	Packet Count
E17	COROLAN Retry	Response
E18	COROLAN Packet Error	Unused
E19	COROLAN Transmission Failure	0
E20	Undefined Interrupt	10xx = Invalid Interrupt 20xx = Uninitialized Interrupt Vector 30xx = Illegal Instruction 40xx = Divide by Zero 50xx = Spurious Interrupt 60xx = Line 1010 Emulator Trap 70xx = Line 1111 Emulator Trap 8000 = Address Error xx = Current Task Number (Refer to Table 7-10.) qqqq = Bus Error near 4 times qqqq
E21	DSP Checksum Error	0
E22	RS-232C Receive Buffer Overflow	Character
E23	Transmit Format Error	Format
E24	Communication Protocol Error	Protocol
E25	Port Protocol Error	Protocol
E26	HR1 Mode Error	Mode
E27	HR2 Mode Error	Mode
E28	UA Mode Error	Mode
E29	Parity Setting Error	Parity Code

Table 8-9 — *continued*

CODE	DESCRIPTION	QUALIFIER
E30	Baud Rate Error	Baud or Baud/100
E31	RS-232C Initialization Case Error	Special
E32	USART Special Receive Condition	8530 Read Register 1 (J109 Connector) 47 = Framing Error 2x = Overrun Error 1x = Parity Error 68901 Receiver Status Register (J110 Connector) 104x or Cx = Overrun Error 102x = Parity Error 101x = Framing Error 68681 Status Register A (NIBP Module) 201x = Overrun Error 202x = Parity Error 204x = Framing Error 208x = Received Break 68681 Status Register B (SpO_2 Module) 301x = Overrun Error 302x = Parity Error 304x = Framing Error 308x = Received Break
E33	Receive Character Error	ppcc where pp is the protocol; cc is the offending character. pp values are: 0 = any protocol not listed below 1 = Corometrics Spectra-Tel System 2 = Model 115 Transmit/Receive Mode 3 = Corometrics Model 556 4 = Internal NIBP Module 5 = Internal SpO_2 Module
E34	Mail Error	Task and Mail Type ttmm where tt is the task (Refer to Table 7-10.)
E35	Sampler Extraneous Timeout	0
E36	Communication RAM Error	0
E37	Data Reception Error	Data Kind
E38	Warmstart, Possible Watchdog Timeout	0
E39	Transmit Busy	1 = Mid-Message 0 = Otherwise 68901 Transmit buffer full and transmitting another byte
E40	NIBP Module Message Start Error	Length of the partial message discarded. A new message started before the previous one completed.
E41	Length Error from SpO_2 Module	The ASCII codes for the length, as hhll. For example: 3235 = 25 decimal
E42	Message Error from SpO_2 Module	Data Byte
E43	SpO_2 Module Message Sync Error	Length

Table 8-9 — *continued*

CODE	DESCRIPTION	QUALIFIER
E44	No answer from NIBP Module. Blood pressure reading not completed within 125 seconds.	Start Age Timer
E45	Invalid NIBP Message Type	Message Type
E46	Invalid NIBP Error Code	Error Code
E47	Spare	—
E48	SpO_2 Module Error	Error Number: 1 = RAM Error (causes REPAIR error) 2 = ROM Error (causes REPAIR error) 3 = Data Link Checksum Error 4 = Write Not Permitted 5 = Value Out of Range 6 = Calibration Failed 7 = Calibration Already in Progress 8 = Calibration Request Denied 9 = Communication Syntax Error
E49	Spare	—
E50	Message Error from NIBP Module	Length and First Character as llcc CCxx = Checksum Failed FCBA = Error Message with Error Code NO ERROR
E51	Timeout of NIBP Module	State (see E53) 3 = Begin Reading 4 = Taking Reading 5 = Done Reading 6 = Stopping A = Manometer or Pneumatic Test Done
E52	NIBP Module REPAIR Error	10ss: NIBP Module System Failure ss = state (see E53) FFFF = Module unresponsive to status requests 0 = NIBP Module continues to send Each of these errors (except 10ss) will also generate E71 if SW2-3 is ON.
E53	NIBP Module State Error. Received a valid message, however unexpected in this state.	State which this message is expected and the current state as eecc: 0 = Init 1 = Idle 2 = Idle, Checking on NIBP Module 3 = Begin Reading 4 = Taking Reading 5 = Reading Complete 6 = Stopping 7 = External NIBP Module 8 = Manometer Test Mode 9 = Pneumatic Test Mode A = Manometer or Pneumatic Test Done B = Error C = Error D = Repair E = No Module 88cc: Attempt to start manometer or pneumatic test during reading or test 99cc: Attempt to start a reading during a reading EFcc: State change to an invalid state ABCD: NIBP Module in neonatal mode ABCE: NIBP Module in neonatal mode

Table 8-9 — *continued*

CODE	DESCRIPTION	QUALIFIER
E54	NIBP Module Self-Test Failure	State (see E53)
E55	Audio Note Error	Invalid Prescaler for a Beep FFcc = Attempted Infinite Loop cc = the cause
E56	SpO_2 Module Message Error	Length and Index as liii Length only as 1100 Message character as cc FFFF = Timed Out; No Answer
E57	MECG Attribute Error	Attribute Bits
E58	Spurious NIBP Message	Message Type
E59	Attempt to Re-Alarm on a Condition after the Condition Changed	See E61
E60	Cancel During Setup Error (Half-Cancel)	See E61
E61	Alarm Internal Consistency Failure	nrcs where: s = Alarm State 0 = No Alarm 1 = Alarming (uncancelled) 2 = Alarm Cancelled During Setup 3 = Alarm Cancelled c = Current Cause; r = Original Cause 0 = No Value Yet 1 = No Alarm 2 = Low Limit Exceeded 3 = High Limit Exceeded 4 = Error Condition n = the sum of the following: 1 = Flash the Display 2 = Sound the Beep 4 = Re-Alarm Timer Running 8 = Not NIBP
E62	Retry Command Issued to SpO_2 Module	knnn where nnn is the Number of Failed Tries; k is: 4 = Response Time 8 = No Answer to Command in 1 second C = Waveform Rate The 4nnn and Cnnn qualifiers occur when the SpO_2 Module responds with the incorrect setting.
E63	SpO_2 Response Time Invalid from Battery RAM	Value from Battery RAM
E64	SpO2 Module Error	1111 = Module Appeared FFFF = Value Error nn = 10 tries of message nn failed. (The module is probably not connected.) Values of nn are: 41 = Initialize (shortly after power up) 56 = Blipper Waveform Rate (20/sec) 4D = Response Time
E65	NIBP Internal Check Failure	b0sc where b are bits: 1 = Auto Mode 2 = Auto Interval Changing 3 = Unused 4 = NIBP Alarm s is the state: 0 = Inactive 1 = Idle 2 = Determination in Progress c = Mail Command

Table 8-9 — *continued*

CODE	DESCRIPTION	QUALIFIER
E66	NIBP Module Retry	ssnn where nn = Number of Tries ss = State (see E53) The NIBP Module did not respond to a command in a timely fashion. The command was repeated.
E67	No Response from NIBP Module	ssnn (see E66) Repeated tries failed. Module not functioning or disconnected.
E68	NIBP Module Response	0 The NIBP Module functioning again or re-connected. Previous error of E67.
E69	Missed Mode Change	1 = NIBP 2 = SpO_2 3 = MECG Data Arrived with Off Mode 1001 = NIBP REPAIR Error with Off Mode 1002 = SpO_2 Error with Off Mode 3002 = Pulse Search Error with Off Mode 2001 = Stop NIBP; Mode On with Off Mode 6001 = Stop NIBP; Mode Off with On Mode 1101 = NIBP Error with Off Mode but Ignored 3001 = NIBP Start Arrived with Off Mode
E70	Warmstart Alarm	0 = Error Code says No Error; however System in Error Alarm 1 = Error Code says Error; however System Not in Error Alarm
E71	NIBP Module Dip Switch Error (SW2-3)	0 = NIBP Module Started; SW2-3 Off 1 = NIBP Module Working; SW2-3 Off FFFF = NIBP Module not Responding; however, switches set properly

Table 8-10. Service Task Errors

TASK	TASK NAME	RESPONSIBLITY
1	DSP Poll	DSP Board
2	Trend	Fetal Vital Signs
3	Front Panel	EL Display
4	Rear Panel	J102 Connector
5	Key Poller	Front Panel Pushbuttons
6	Self-Test	Front Panel Test Pushbutton
7	Clock	Time of Day; 10-Minute Update
8	Recorder Control	Paper Motion
9	Alphanumerics	Recorder Print Messages
A	Graphics	Recorder Traces
B	DSP Output	DSP Board
C	Keypad	Models 2115, 2116, or 855
D	Key Interpret	Front Panel Pushbuttons
E	Timeout	
F	Power Up	
10	COROLAN Transmit	J108 Connector
11	COROLAN Control	J108 Connector
12	Keypad Poll	Models 2115, 2116, or 855
13	RS-232C Control	RS-232C Baud Rate Set
14	Internal Test	Internal Test Screens
15	RS-232C Boss 1	J110 Connector
16	RS-232C Boss 2	J109 Connector
17	RS-232C Boss 3	NIBP Module
18	RS-232C Boss 4	SpO_2 Module
19	Receive ISR 1	J110 Connector
1A	Receive ISR 2	J109 Connector
1B	Receive ISR 3	NIBP Module
1C	Receive ISR 4	SpO_2 Module
1D	Transmit ISR 1	J110 Connector
1E	Transmit ISR 2	J109 Connector
1F	Transmit ISR 3	NIBP Module
20	Transmit ISR 4	SpO2 Module
21	Spectra-Tel Format 1	J110 Connector
22	Spectra-Tel Format 2	J109 Connector
23	HR Storage	Spectra-Tel and Model 115 RS-232C
24	Watchdog Timer	
25	RS-232C Setup	RS-232C Protocol Setup
26	Audio	Rear Panel Speaker
27	Key Handler	Front Panel Pushbuttons
28	Alarm	Maternal Vital Signs and Alarms
29	NIBP	Auto/Manual, BP Start/Stop

Test #12, Manometer Mode. Test #12 performs a calibration check of the blood pressure module. This test should be performed once a month by a qualified service person. The following equipment is required in order to perform the test:

- Mercury Manometer with a range of 280 mmHg (37.3 kPa); or digital pressure gauge
- Inflation Hand Bulb
- Corometrics standard hose with a female Luer fitting for a single-tube cuff—the cuff should be removed
- T-connector with a male Luer fitting (remaining fittings dependent upon manometer and hand bulb)

1. Attach the connector end of the pneumatic hose to the **Maternal BP** connector on the front panel as follows:

   a. Ensure the metal collar is in the release position by applying pressure downward on the tab.

   b. Insert the connector into the receptacle until the metal collar snaps into the upward lock position.

2. Attach a T-connector with a male Luer fitting to the cuff end of the pneumatic hose.

3. Connect the appropriate end of the T-connector to the inflation bulb.

4. Connect the remaining end of the T-connector to the manometer tubing.

5. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 12, shown in Figure 8-15.

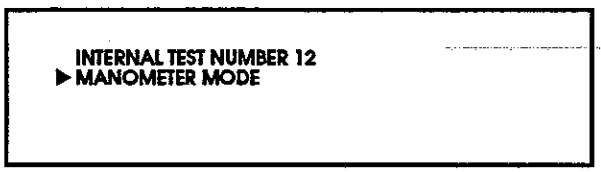

Figure 8-15. Manometer Mode Screen.

6. Press **Select** or **BP Start** to activate the test. The display should show a pressure of 0 mmHg (0 kPa), as shown in Figure 8-16. If you do not wish to continue the test at any point, continue on to step 11.

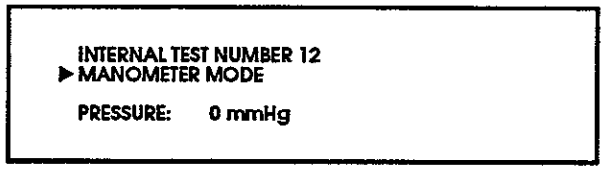

Figure 8-16. Manometer Mode Upon Activation

7. Using the inflation bulb, manually pump up the pressure to 200 mmHg ± 1 mmHg (26.7 kPa ± .2 kPa), as indicated by the manometer. Verify that the monitor displays a pressure reading of 200 mmHg ± 5 mmHg (26.7 kPa ± .7 kPa).

8. Hold the pressure at 200 mmHg (26.7 kPa) for 30 seconds and verify that the pressure indicated by the monitor does not change. If the monitor is unable to hold the pressure for the test period, deflate the pressure to zero, check the assembly of the calibration equipment, and repeat the test procedure. If the monitor fails to hold the pressure a second time, contact your Corometrics Service Representative.

9. Using the same procedure, verify that the monitor displays the correct pressure at the pressure levels indicated in Table 8-11. If the pressure levels are not within tolerance, contact your Corometrics Service Representative.

10. Slowly inflate the manometer, using the inflation bulb, until a pressure of 280 mmHg ± 10 mmHg (37.3 kPa ± 1.3 kPa) is reached. The display should read **OVERPRESSURE**.

    NOTE: If the overpressure message is not indicated, or if the overpressure reading is not within the specified tolerance, contact your Corometrics Service Representative. Do not use this monitor to perform blood pressure readings until the problem is corrected.

11. Press **BP Stop** or **Select** to terminate the test. **TEST STOPPED** is displayed at the bottom of the screen.

Table 8-11. Calibration Check Pressure Levels

MANOMETER PRESSURE LEVEL	MODEL 118 PRESSURE LEVEL
0 mmHg + 1 mmHg (0 kPa + .1 kPa)	0 mmHg + 1 mmHg (0 kPa + .1 kPa)
50 mmHg ± 1 mmHg (6.7 kPa ± .2 kPa)	50 mmHg ± 4 mmHg (6.7 kPa ± .5 kPa)
100 mmHg ± 1 mmHg (13.3 kPa ± .2 kPa)	100 mmHg ± 4 mmHg (13.3 kPa ± .5 kPa)
150 mmHg ± 1 mmHg (20 kPa ± .2 kPa)	150 mmHg ± 4 mmHg (20 kPa ± .5 kPa)
200 mmHg ± 1 mmHg (26.7 kPa ± .2 kPa)	200 mmHg ± 5 mmHg (26.7 kPa ± .7 kPa)

Test #13, Pneumatic Test. Test #13 provides a pneumatic test of the blood pressure module. This test should be performed at least once every 90 days by a qualified Service Representative. The following equipment is required to perform this test:

- Corometrics standard hose with a female Luer fitting for a single-tube cuff—the cuff should be removed
- Male Luer Plug

1. Plug the male Luer plug into the cuff connector at the end of the pneumatic tubing and twist one quarter turn. Ensure that the plug is securely connected.

2. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 13, shown in Figure 8-17.

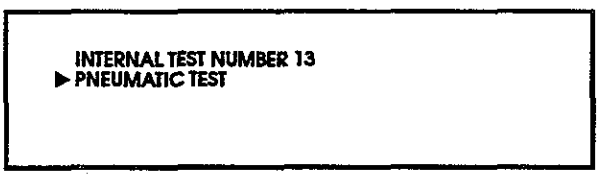

Figure 8-17. Pneumatic Test Screen

3. Depress **Select** or **BP Start** to activate the test. **WORKING . . .** is displayed at the bottom of the screen. At the completion of the test, either **TEST PASSED** or **TEST FAILED** is displayed at the bottom of the screen. If you do not want to complete the test, continue to step 4.

   NOTE: If the monitor fails the pneumatic test, check hoses and fittings and try the test again. If the monitor fails the test a second time, contact your Corometrics Service Representative. Do not use the monitor to perform blood pressure readings until the problem is corrected.

4. Press **BP Stop** or **Select** to terminate the test. **TEST STOPPED** is displayed at the bottom of the screen.

Test #14, Print User Setup. Test #14 provides a listing of the monitor's Setup Mode configuration:

- BP Interval
- SpO_2 Volume
- BP, SpO_2, and MECG Audio Alarm On/Off Settings
- Alarm Volume
- SpO_2 Response Time
- SpO_2 Print Interval
- SpO_2 Trace On/Off Setting
- Re-Alarm Time
- BP and SpO_2 Alarm Limits

1. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 14, shown in Figure 8-18.

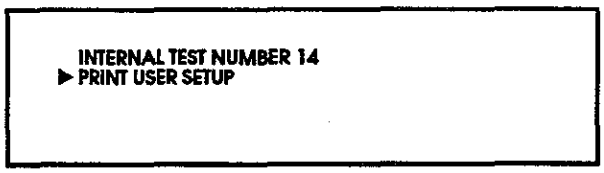

Figure 8-18. Print User Setup Screen

2. Press **Select** to activate the test. **WORKING . . .** is displayed at the bottom of the screen and the strip chart recorder begins to print the Setup Mode information. When the printout is complete, **TEST COMPLETE** appears at the bottom of the screen. If you do not wish to complete the test, continue on step 3.

   NOTE: If no paper is installed in the recorder, the test will not activate. Also, if paper runs out during the test, the test will automatically stop.

3. Press **Setup** or **Select** to terminate the test.

Test #15, Print System Setup. Test #15 provides a listing of the following system information:

- Power-On Setup Mode
- BP 1-Minute Interval Setting
- SpO_2 Disconnect Alarm Setting
- Startup Volume Percentage
- BP Done Volume Percentage
- HR Offset Mode
- Language Option
- IUP Units
- BP Units
- RS-232C, J109 and J110 Port Configurations

1. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 15 shown in Figure 8-19.

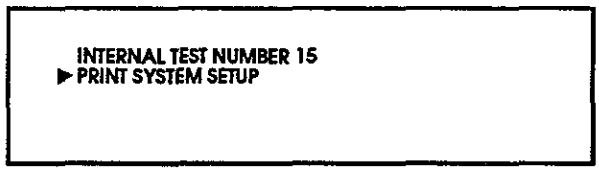

Figure 8-19. Print System Setup Screen

2. Press **Select** to activate the test. **WORKING . . .** is displayed at the bottom of the screen and the strip chart recorder begins to print the System Setup information. When the printout is complete, **TEST COMPLETE** appears at the bottom of the screen. If you do not wish to complete the test, continue to step 3.

   NOTE: If no paper is installed in the recorder, the test will not activate. Also if paper runs out during the test, the test will automatically stop.

3. Press **Setup** or **Select** to terminate the test.

Test #16, Print Unit Info. Test #16 provides a printout of the following information:

- Date of First Monitor Use
- Number of BP Determination Attempts
- CAS BP Module Software Version Number
- Nellcor, Inc. SpO_2 Module Software Version Number

1. While the Internal Test Screen is displayed, use the △▽ pushbuttons to display Test Number 16, shown in Figure 8-20.

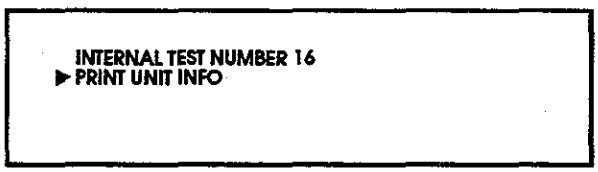

Figure 8-20. Print Unit Information Screen

2. Press **Select** to activate the test. **WORKING . . .** is displayed at the bottom of the screen and the strip chart recorder begins to print the System Setup information. When the printout is complete, **TEST COMPLETE** appears at the bottom of the screen. If you do not wish to complete the test, continue on to step 3.

NOTE: If no paper is installed in the recorder, the test will not activate. Also if paper runs out during the test, the test will automatically stop.

3. Press **Setup** or **Select** to terminate the test.

Test #17, Audio Amp Test. Test #17 provides a method of testing the audio amplifier circuitry of the Model 118.

1. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 17, shown in Figure 8-21.

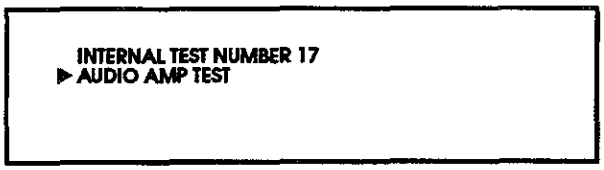

Figure 8-21. Audio Amp Test Screen

2. Press **Select** to activate the test. **WORKING . . .** is displayed at the bottom of the screen. The rear panel speaker will test the audio amplifier circuitry by emitting a tone that starts at the lowest volume setting and gradually increases until the highest volume setting; the volume then decreases to the lowest setting. The cycle continues until you stop the test in step 3. (Since the Model 118 uses two sources for generating audio tones, each cycle of this test alternates between the two sources.)

3. Press **Setup** or **Select** to terminate the test. **TEST STOPPED** appears at the bottom of the screen.

Test #18, Wallplate Check. Test #18 performs an address and LED test on the COROLAN wallplate the Model 118 is attached to.

1. While Service Screen #3 is displayed, use the △▽ pushbuttons to display Test Number 18, as shown in Figure 8-22.

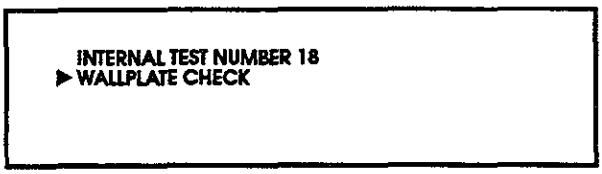

Figure 8-22. Wallplate Check Screen

2. Press **Select** to activate the test. The green **ARCHIVE** indicator on the COROLAN wallplate should flash at a rate of 1 Hz; the wallplate address number is displayed at the bottom of the screen, as shown in Figure 8-23. (If you run this test when a monitor is not connected to a COROLAN network, **??** is displayed in place of the wallplate address.) If you do not wish to complete the test, continue to step 3.

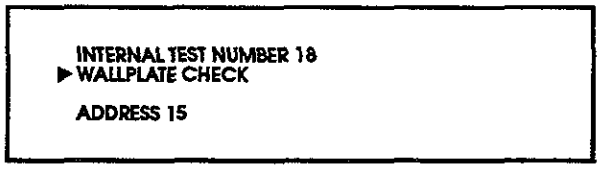

Figure 8-23. Wallplate Check Results Example

3. Press **Setup** or **Select** to terminate the test. **TEST STOPPED** appears at the bottom of the screen.

Key Test

This test provides a quick visual method of testing the functionality of each front panel pushbutton.

1. Power on the Model 118 while depressing and holding the **Test** pushbutton. Service Screen #1 is automatically displayed.

2. Press the **Setup** pushbutton three times to display Service Screen #4, shown in Figure 8-24.

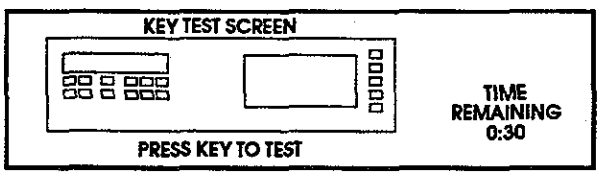

Figure 8-24. Service Screen #4

3. Test each front panel pushbutton one at a time by depressing and holding the key. The corresponding key location will illuminate on the monitor illustration on the Key Test Screen. Figure 8-25 provides an example of the **BP Start** pushbutton being tested.

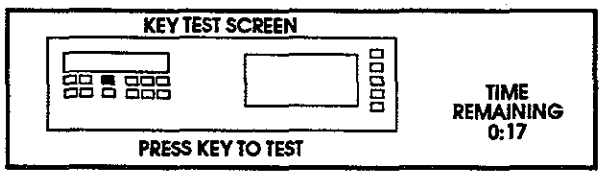

Figure 8-25. BP Start Key Test Example

4. Since each key is needed for testing purposes, you must wait until this test times out after 30 seconds to exit the test procedure.

5. Once the Model 118 illustration on Service Screen #4 disappears, press **Record** or **Test** to exit the Service Mode.

OPERATING DIAGNOSTIC TESTS

The Model 118 continuously performs certain diagnostic tests while in the normal operating mode. If a problem is detected, the unit will display an error message on the front panel display. Refer to Table 8-12 for a complete list of error messages.

Table 8-12. Major Malfunction Error Messages

FRONT PANEL ERROR MESSAGE
CPU ROM Failure
CPU RAM Failure
CPU could not access DSP RAM
DSP Failure
DSP ROM CRC Failure
DSP A/D Error
DSP Correlator Program Error
DSP RAM Failure
DSP Health Check Failed
DSP Program RAM Failed
DSP Data RAM Failed
DSP Cycle Time Not Met
DSP Reference Voltage Error
Nonvolatile RAM Failure
DUART Failure
DMA Failure